Table of Contents

MPR Project No. 07670-4200

Authors: Barbara Devaney
Thomas Fraker
with Karen Morgan

Research Programmers: Judy Richter
Deborah Reichert
Sheila Mapes

THE DIETARY IMPACTS OF THE SCHOOL BREAKFAST PROGRAM

FINAL REPORT

APRIL 7, 1987

Prepared for:

U.S. Department of Agriculture
Food and Nutrition Service
10th Floor
3101 Park Center Drive
Alexandria, Virginia 22302

Prepared by:

Mathematica Policy Research
P.O. Box 2393
Princeton, N.J. 08543-2393

Under subcontract to The Urban Institute,
Contract No. FNS-53-3198-5-56

Table of Contents

EXECUTIVE SUMMARY

This study examines the effects of the School Breakfast Program (SBP) on the likelihood of eating any breakfast, on the types and quantities of foods eaten at breakfast, on macronutrient and cholesterol intake, and on food energy and micronutrient intake. The study is based on data provided in a 24-hour dietary recall survey that was conducted in the fall of 1980 as part of the first National Evaluation of School Nutrition Programs (NESNP-1).

The analysis of the decision to eat any breakfast, where breakfast includes all foods eaten at or before school, indicates that the SBP has no apparent influence on the likelihood of eating any breakfast. This result is based both on a descriptive table showing the percentage of students eating any breakfast by age, sex, and SBP availability and on a multivariate analysis of the probability of eating any breakfast.

The analysis of the breakfast food items consumed at or before school indicates that the foods consumed by SBP participants differ significantly from the foods consumed by nonparticipants who eat breakfast. SBP participants are generally more likely than nonparticipant breakfast eaters to consume milk products, citrus juices, other fruit, and pancakes or the like at breakfast and are generally less likely to consume eggs and dry/prepared cereals. On the other hand, except for milk products and a few less commonly reported breakfast foods, SBP participants have significantly lower average quantities consumed of the breakfast food items than nonparticipants, even for those foods consumed by proportionately more SBP participants.

Two important findings come from the analyses of the effects of the SBP on macronutrient and cholesterol intake:

1. Participation in the SBP has no statistically significant relationship with the proportion of total food energy obtained from protein, fat, or carbohydrate. This finding holds true for students of all ages and for both the breakfast and 24-hour time periods.

2. Students 5 to 10 and 11 to 14 years of age who participate in the SBP consume significantly less cholesterol both at breakfast and over 24 hours than nonparticipants. The cholesterol intake of students 15 to 21 years of age is unrelated to SBP participation.

The analysis of food energy and micronutrient intake at breakfast and over 24 hours focuses on the intake of food energy, vitamin B_6, vitamin A, iron, calcium, and magnesium. These six dietary components are chosen because these nutrients generally have the lowest intake levels and the lowest percentage meeting the RDA for school-age children, and these nutrients are the ones found to vary most by SBP participation status in the NESNP-1 analyses.

The analysis of food energy and micronutrient intake shows mixed effects of the SBP. Five principal findings come from this analysis:

1. The most consistent relationship is observed for the breakfast intake of calcium; for students of all ages, SBP participation is associated with greater intakes of calcium at breakfast. In addition, for students 5 to 10 years of age, who have the highest rates of participation in the SBP, SBP participation is also associated with greater intakes at breakfast of food energy and magnesium and with a lower intake at breakfast of iron. For students 11 to 14 years of age, SBP participants have significantly lower intakes of vitamin A and iron at breakfast than nonparticipants who eat breakfast. For children 15 to 21 years of age, who have very low rates of participation in the SBP and, hence, very small sample sizes with which to estimate program impacts, the only significant relationship between SBP participation and nutrient intake at breakfast is for calcium.

2. The daily diets of young children ages 5 to 10 who participate in the SBP do not complement the breakfasts these children receive. This finding is based on a 24-hour analysis of nutrient intake that shows that the estimated effects of the SBP are attenuated over 24 hours. The positive relationships between nutrient intake at breakfast and SBP participation for food energy, calcium, and magnesium are insignificant over 24 hours, the insignificant relationship between the intake of vitamin A at breakfast and SBP participation is negative over 24 hours, and the negative relationship between iron intake at breakfast and SBP participation is even more negative over 24 hours.

3. For children 11 to 14 years of age, SBP participation is associated with lower 24-hour intakes of food energy and vitamin B_6; no significant positive relationships with nutrient intake over 24 hours are observed. For children 15 to 21 years of age, SBP is associated with a higher daily intake of calcium.

4. The analysis of whether students achieve the RDA over 24-hours reinforces the nutrient intake findings regarding the nutritional benefits of the SBP with respect to higher calcium intake. Participation in the SBP is positively associated with the probability of meeting the RDA for calcium for the oldest and youngest students. However, SBP participation is negatively associated with the probability of meeting the RDA for vitamin B_6 for the two older age groups, and is negatively related to the probability of meeting the RDA for vitamin A for students 5 to 10 years of age.

5. Of the three traditional daily meals, breakfast is the most important predictor of daily nutrient intake and whether the RDA are satisfied. Eating any breakfast has a significant, positive impact on the daily intake of food energy and all five micronutrients examined. Breakfast is particularly important for the daily intake of vitamin B_6 and for whether the RDA for vitamin B_6 is met.

Except with respect to food energy, the findings from the analysis of the breakfast food items consumed at or before school are generally consistent with the findings from the nutrient intake analyses. That is, the positive relationship between SBP participation and the intake of calcium can be attributed to the higher percentage of SBP participants consuming milk products at breakfast and higher average quantities of milk consumed. On the other hand, the observed lower intake of iron at breakfast for SBP participants relative to nonparticipants reflects the lower average quantities consumed of most breakfast food items, particularly the heavily fortified dry/prepared cereals that provide iron. Finally, the lower intake of cholesterol for SBP participants relative to nonparticipants is consistent with the lower percentage of SBP participants consuming eggs at breakfast and the lower average quantities of eggs consumed relative to nonparticipants who eat an alternative breakfast.

CONTENTS

Section		Page
	EXECUTIVE SUMMARY	i
I	INTRODUCTION	1
	A. BACKGROUND OF THE SCHOOL BREAKFAST PROGRAM	2
	B. REVIEW OF THE NESNP-1 ANALYSIS OF THE SCHOOL BREAKFAST PROGRAM	4
	C. STUDY OBJECTIVES	6
	D. OVERVIEW OF FINDINGS	9
II	DATA AND ANALYTIC APPROACH	14
	A. DESCRIPTION OF THE DATA	14
	B. METHODOLOGY	17
III	IMPACTS OF THE SCHOOL BREAKFAST PROGRAM ON FOOD ENERGY AND MICRONUTRIENT INTAKE	20
	A. SUMMARY OF FINDINGS	20
	B. THE DECISION TO EAT ANY BREAKFAST	23
	C. FOOD ENERGY AND MICRONUTRIENT INTAKE AT BREAKFAST	29
	D. FOOD ENERGY AND MICRONUTRIENT INTAKE OVER 24 HOURS	42
IV	IMPACTS OF THE SCHOOL BREAKFAST PROGRAM ON MACRONUTRIENT AND CHOLESTEROL INTAKE	57
	A. SUMMARY OF FINDINGS	57
	B. MACRONUTRIENT INTAKE	57
	C. CHOLESTEROL INTAKE	68
V	FOOD ITEMS EATEN AT BREAKFAST	72
VI	SUMMARY AND CONCLUSIONS	81
	REFERENCES	85
	APPENDIX A. SUPPLEMENTAL TABLES: FOOD AND MICRONUTRIENT INTAKE	
	APPENDIX B. SUPPLEMENTAL TABLES: MACRONUTRIENT AND CHOLESTEROL INTAKE	
	APPENDIX C. COMPARISON OF FINDINGS FROM THIS STUDY WITH FINDINGS FROM NESNP-1	
	APPENDIX D. TABLE OF SUMMARY STATISTICS FOR INDEPENDENT VARIABLES USED IN THE NUTRIENT INTAKE ANALYSES	

Table of Contents

TABLES

Table		Page
1	SUMMARY OF NUTRIENT INTAKE FINDINGS: DIFFERENCES IN NUTRIENT INTAKE BETWEEN SBP PARTICIPANTS AND NON-PARTICIPANTS	11
2	SUMMARY OF FOOD ITEM ANALYSIS: DIFFERENCES IN PERCENTAGES CONSUMING AND AVERAGE QUANTITIES CONSUMED BETWEEN SBP PARTICIPANTS AND NONPARTICIPANTS	13
3	WEIGHTED AND UNWEIGHTED SAMPLE SIZES FOR SCHOOL BREAKFAST ANALYSIS	24
4	DESCRIPTIVE DATA ON PERCENT EATING ANY BREAKFAST	26
5	PROBIT EQUATIONS FOR THE PERCENT EATING ANY BREAKFAST	27
6	EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE	37
7	EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE	38
8	EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE	39
9	EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 5 TO 10 YEARS OF AGE	44
10	PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES: STUDENTS 5 TO 10 YEARS OF AGE	48
11	EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 11 TO 14 YEARS OF AGE	50
12	PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES: STUDENTS 11 TO 14 YEARS OF AGE	52
13	EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 15 TO 21 YEARS OF AGE	54
14	PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES: STUDENTS 15 TO 21 YEARS OF AGE	55
15	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE	60

TABLES (Continued)

Table		Page
16	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE	61
17	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE	62
18	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 5 TO 10 YEARS OF AGE	64
19	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 11 TO 14 YEARS OF AGE	65
20	EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 15 TO 21 YEARS OF AGE	66
21	EQUATIONS FOR INTAKE OF CHOLESTEROL IN MILLIGRAMS AT BREAKFAST	69
22	EQUATIONS FOR INTAKE OF CHOLESTEROL IN MILLIGRAMS OVER 24 HOURS	70
23	FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE	73
24	FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE	76
25	FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE	78

Table of Contents

I. INTRODUCTION

Authorized by both the Child Nutrition Act of 1966 and the 1975 amendments to the Child Nutrition Act, the School Breakfast Program (SBP) has as its primary objective "to safeguard the health and well-being of the nation's children." In 1979, after passage by the U.S. Senate of a bipartisan resolution calling for a comprehensive evaluation of school nutrition programs, the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) began a national evaluation of the School Lunch, School Breakfast, and Special Milk Programs in order to determine, among other things, whether the nutritional objectives of the programs were being satisfied. This evaluation included two major data collection and analysis efforts. The first of these, which was conducted during the 1980-81 school year and is known as the National Evaluation of School Nutrition Programs (NESNP-1), provided the data to analyze the nutritional impacts of the SBP.

The objectives of this analysis are to expand the NESNP-1 analyses of the impact of the SBP and to examine in detail school and non-school breakfasts so as to identify those factors responsible for the differences in the nutrient intake of SBP participants and nonparticipants. Briefly, the analysis has four components:

1. An analysis of the relationship between SBP availability and the likelihood of eating any breakfast.

2. A re-analysis of the NESNP-1 models of nutrient intake to determine if the previous findings regarding the nutritional impact of the SBP persist after some revisions are made to the NESNP-1 models

3. An analysis of the effect of the SBP on macronutrient and cholesterol intake

4. An examination of the foods eaten at breakfast to determine if the types and/or quantities of foods consumed differ between SBP participants and nonparticipants who eat breakfast

This report is organized as follows. The remainder of this introductory chapter provides background information on the SBP, reviews the NESNP-1 analyses of the SBP, describes the objectives of this study, and provides a brief overview of our findings. Chapter II describes the data used in the analysis and our analytic approach. Chapter III summarizes the analysis of the impact of the SBP on (1) the decision to eat any breakfast and (2) food energy and micronutrient intake at breakfast and over 24 hours. Chapter IV presents the analysis of the relationship between SBP participation and macronutrient and cholesterol intake. Chapter V is an analysis of the food items consumed at breakfast. A summary concludes the report.

In addition, this report has four appendixes. Appendix A contains descriptive tables on food energy and micronutrient intake and on the percentage of students achieving 75 percent and 100 percent of the RDA. Appendix B includes supplemental descriptive tables and tables of regression results for the macronutrient analysis. Appendix C provides a summary of both the findings from this study and the findings from NESNP-1, and Appendix D contains a table of summary statistics for the independent variables used in the dietary impact analyses.

A. BACKGROUND OF THE SCHOOL BREAKFAST PROGRAM

The SBP was originally a pilot program targeted to children from low-income school districts in order to provide a nutritious meal to children who might otherwise not receive an adequate breakfast. With the 1975 passage of the Amendments to the Child Nutrition Act of 1966, the SBP

was made a permanent program and federal funding was made available to all schools choosing to offer school breakfasts. Schools offering the SBP receive federal support primarily by a performance funding mechanism. USDA reimburses states for every breakfast served in accordance with federal regulations. The reimbursement rates for breakfast depend on whether the student is eligible for full-price, reduced-price, or free breakfasts, where eligibility is determined on the basis of family income and family size.[1] At the time of the NESNP-1 surveys (fall 1980), reimbursement rates were 14.75 cents for full-price breakfasts, 42.5 cents for reduced-price breakfasts, and 52 cents for free breakfasts, and the income cutoffs for free and reduced-price meals were 125 percent and 195 percent, respectively, of the poverty guidelines set by the Office of Management and Budget.

As of fall 1980, approximately 33,000 public schools, or 33.4 percent of all public schools, participated in the SBP. These schools served an average of 3.8 million meals daily. In contrast, over 94,000 schools, or 97 percent of all public schools, participated in the National School Lunch Program (NSLP). In addition, the original objective of the SBP to serve predominantly low-income school districts is apparently still being satisfied. In comparison to schools not participating in the SBP, schools participating in the SBP were generally larger, had lower per-pupil expenditures from local sources, and occurred disproportionately in poor, southern, and urban districts. Moreover, of the 3.8 million breakfasts provided by the SBP, approximately 80 percent were free and 7 percent were reduced-price (Wellisch et al., 1983a).

---

[1] Eligibility here refers only to the price status of a participant. Any student attending a school that serves school breakfasts is eligible to participate in the SBP.

B. REVIEW OF THE NESNP-1 ANALYSIS OF THE SCHOOL BREAKFAST PROGRAM

Findings from the NESNP-1 analyses suggest that the nutritional benefits of the SBP include (1) higher intakes of calcium and magnesium at breakfast, (2) a higher intake of calcium over 24 hours, and (3) a higher likelihood that students will eat a breakfast (Wellisch et al., 1983a and 1983b). Despite this evidence of positive nutritional contributions of the SBP, evidence of a negative association between SBP participation and nutrient intake was found for vitamin A, vitamin B_6, and iron. These findings are important since these three nutrients are ones for which large proportions of children (as well as adults) fail to obtain the Recommended Dietary Allowances (RDA).[1] On the other hand, calcium and magnesium are also nutrients found to be lacking in the diets of school-age children and the evidence of higher intakes of these nutrients for SBP participants relative to nonparticipants implies substantial nutritional benefits of the SBP.

These findings are based on an extensive set of regression results presented in Volume 2 of the NESNP-1 Final Report. The model used to generate these results is a component of a larger model of the effects of the NSLP, the SBP, and the Special Milk Program (SMP) on nutrient intake at breakfast, lunch, and over 24 hours. The larger model included 106 dependent variables, as follows:

- Nutrient intake for breakfast, lunch, and over 24 hours for food energy and for each of 11 nutrients (36 dependent variables).

---

[1] Descriptive data on percentages of students meeting the RDA are presented in Appendix A of this report.

- Nutrient adequacy ratios for breakfast, lunch, and 24 hours, which were calculated for food energy and for each of 11 nutrients (36 dependent variables). A nutrient adequacy ratio (NAR) is the percent of the Recommended Dietary Allowance (RDA) obtained for a specific nutrient.

- Mean adequacy ratio (MAR) over 24 hours, which is the average of the nutrient adequacy ratios for all nutrients except food energy and protein, where each NAR is truncated at 100 percent (1 dependent variable).

- Index of nutritional quality (INQ) for breakfast, lunch, and 24 hours, which were calculated for each of 11 nutrients (33 dependent variables). The INQ for a specific nutrient is the ratio of the percent of the RDA obtained to the percent of the RDA obtained for food energy.

To assess the impact of participation in the school nutrition programs, seven mutually exclusive dummy variables for program participation were used: (1) SBP participant only, (2) NSLP participant only, (3) SMP participant only; (4) SBP-NSLP participant, (5) SBP-SMP participant, (6) NSLP-SMP participant, and (7) SBP-NSLP-SMP participant.

The NESNP-1 nutritional analysis consisted of a general, all-purpose model applied to nutrient intake and diet quality at breakfast, lunch, and over 24 hours. A comprehensive set of explanatory variables (a total of 38 or 39 variables) is included in all 106 regression equations. In particular, all seven program variables appear in every nutrient intake regression. The inclusion of the same set of program variables in every nutrient regression is a critical feature of the NESNP-1 nutritional analysis since virtually all of the substantive findings regarding the nutritional impacts of the school nutrition programs are based on this specification. For example, the findings reported for the effects of the SBP are derived from comparing the coefficient on the program variable for whether the student is a participant in both the NSLP and SBP program to the coefficient on the program variable for whether the student is a

participant in the NSLP only. This is somewhat difficult to interpret because: (1) it is not clear why a variable denoting participation in the NSLP is an explanatory variable in the breakfast nutrient intake equations; (2) at best, this comparison shows only the added benefits of participation in the SBP over and above participation in the NSLP; and (3) a thorough assessment of the nutritional impacts of the SBP should incorporate the coefficients on all the SBP program variables--SBP participant only, SBP-NSLP participant, SBP-SMP participant, and SBP-NSLP-SMP participant.

As discussed in the following section, the objectives of our analysis of the SBP is to improve, where possible, the NESNP-1 model specifications and to expand our knowledge of the nutritional effects of the SBP. In contrast to the NESNP-1 general model of nutrient intake at breakfast, lunch, and over 24 hours, our analysis of the nutritional impacts of the SBP employs a model focused more specifically on the relationship between nutrient intake and SBP participation. In addition, we examine the statistical relationship between SBP participation and the likelihood of eating any breakfast and expand the scope of the NESNP-1 nutritional analysis to include macronutrient and cholesterol intake and an analysis of the food items eaten at breakfast. The following section describes in more detail the objectives and specific components of our analysis.

C. STUDY OBJECTIVES

NESNP-1 was a large-scale, comprehensive evaluation of three school nutrition programs--the NSLP, the SBP, and the SMP. It had four major objectives corresponding to four concerns outlined in the Senate Resolution calling for a national evaluation of the school nutrition programs. One of these four objectives was to determine the impact of the school nutrition

programs upon students and their families. The impacts considered were household food expenditures, dietary intake, and anthropometric measures. In short, the NESNP-1 analysis of the dietary impacts of the SBP was only one piece of a comprehensive national evaluation quite expansive in scope.

In contrast, this study is a more narrowly focused analysis of specific dietary impacts of the SBP. It is not intended to be a substitute or alternative for the NESNP-1 nutritional analysis of the SBP; rather, its objectives are to expand our knowledge gained from NESNP-1 of the dietary effects of the SBP. Specifically, this study expands the NESNP-1 analysis of the SBP to examine the effects of the SBP on macronutrient and cholesterol intake and to analyze the actual breakfast food choices of SBP participants and nonparticipants. In addition, based on our review of the NESNP-1 analysis, our analysis of the dietary impacts of the SBP involves some revisions to the NESNP-1 model of nutrient intake. These revisions to the NESNP-1 analysis are useful for examining in a systematic manner the effect of SBP availability on the likelihood of eating any breakfast and for determining whether the overall substantive findings regarding SBP participation and nutrient intake persist with a model focused more narrowly on explaining the nutritional effects of the SBP.

Although a more detailed discussion of the specific differences between the analysis of nutrient intake in this study and the comparable analysis from NESNP-1 is included in Chapter III of this report, one revision to the NESNP-1 analysis is important to highlight at this point, as it affects all analyses of the breakfast data presented in this report. Breakfast in this study is defined to include both breakfast and pre-breakfast foods, whereas in the NESNP-1 analysis, breakfast included only foods at a meal which respondents defined as breakfast. This revision was made based on subsequent analysis under the second National Evaluation

labelled as pre-breakfast foods should also be considered part of breakfast (Hanes, 1984).

The remainder of this section provides a brief overview of each component of our analysis of the dietary impacts of the SBP.

1. The Decision To Eat Any Breakfast

Given that approximately 12 percent of public school students do not eat any breakfast at all (Wellisch et al., 1983a), a thorough analysis of the nutritional effects of the SBP should examine the relationship between program availability and the likelihood of eating any breakfast. The objective of the analysis of the decision to eat breakfast presented in this study is to examine in a systematic manner both the incidence of breakfast skipping and the determinants of the decision to eat breakfast.

2. Food Energy and Micronutrient Intake

This component of the analysis examines the impacts of SBP participation on the intake of food energy and five micronutrients at breakfast and over 24 hours. The analysis of nutrient intake at breakfast builds on the analysis of the decision to eat any breakfast in that the decision of whether or not to eat breakfast is considered a decision that students or their families make and nutrient intake at breakfast is conditional on students eating breakfast. The 24 hour analysis of food energy and micronutrient intake is useful for determining whether the effects of SBP participation on nutrient intake at breakfast persist over 24 hours.

3. Macronutrient and Cholesterol Intake

NESNP-1 provided a comprehensive evaluation of the effects of the SBP on the intake of food energy, protein, and 10 micronutrients. However, no analysis of the intake of fat, carbohydrate, or cholesterol was undertaken in NESNP-1. The objective of this component of our analysis is to expand the NESNP-1 analysis of the dietary impacts of the SBP by examining the effects of the SBP on (1) the proportion of food energy derived from protein, fat, and carbohydrate both at breakfast and over 24 hours and (2) cholesterol intake at breakfast and over 24 hours.

4. Food Items Eaten at Breakfast

The objective of this part of our analysis is to identify the food choices of SBP participants and nonparticipants in order to understand better the differences in nutrient intake between SBP participants and nonparticipants. Descriptive tables showing the common breakfast foods consumed and the average quantities consumed are presented, and statistical tests of the differences between SBP participants and nonparticipants in the mean percentages consuming each food item and in the average quantities consumed are conducted to determine if the food choices of SBP participants differ significantly from those of nonparticipants.

D. OVERVIEW OF FINDINGS

The analysis conducted for this report has produced a wealth of empirical results concerning both the nutritional effects of the SBP and the food choices of SBP participants and nonparticipants. The purpose of this section is to present a concise and nontechnical overview of the most salient results presented in the report.

1. Nutritional Effects of the SBP

Four types of dietary impacts of the SBP are examined in this report: (1) the decision to eat any breakfast; (2) nutrient intake at breakfast; (3) nutrient intake over 24 hours; and (4) the likelihood of achieving the Recommended Dietary Allowances (RDA) over 24 hours. In addition, these dietary impacts are estimated separately for three age groupings--students 5 to 10 years of age, students 11 to 14 years of age, and students 15 to 21 years of age.

The analysis of the decision to eat any breakfast shows that the availability of the SBP is not associated with a higher likelihood of eating breakfast.

With respect to the nutritional effects of the SBP, Table 1 provides an overview of the findings concerning the relationship between SBP participation and nutrient intake. In general, these results show mixed effects of the SBP. Four general results can be seen from this table. First, calcium intake and the likelihood of meeting the RDA for calcium are generally positively associated with participation in the SBP, with the strongest and most consistent relationships observed for the oldest and youngest age groups. Second, except for the older teenagers, iron intake at breakfast is negatively related to participation in the SBP. Third, the percentage of food energy derived from protein, fat, and carbohydrate does not differ significantly for SBP participants and nonparticipants. Finally, for the two younger age groups, cholesterol intake both at breakfast and over 24 hours is lower for SBP participants than nonparticipants.

TABLE 1

SUMMARY OF NUTRIENT INTAKE FINDINGS: DIFFERENCES
IN NUTRIENT INTAKE BETWEEN SBP PARTICIPANTS AND NONPARTICIPANTS

	Students 5 to 10 Years of Age			Students 11 to 14 Years of Age			Students 15 to 21 Years of Age		
Dietary Component	Breakfast Intake	24-Hour Intake	Whether Meet RDA	Breakfast Intake	24-Hour Intake	Whether Meet RDA	Breakfast Intake	24-Hour Intake	Whether Meet RDA
Food Energy	+	o	o	o	-	o	o	o	o
Vitamin B_6	o	o	o	o	-	-	o	o	-
Vitamin A	o	-	--	-	o	o	o	o	o
Iron	--	--	o	--	o	o	o	o	o
Calcium	++	o	+	+	o	o	++	+	+
Magnesium	+	o	o	o	o	o	o	o	o
Percentage of Food Energy From:									
Protein	o	o		o	o		o	o	
Fat	o	o		o	o		o	o	
Carbohydrate	o	o		o	o		o	o	
Cholesterol	--	-		--	--		o	o	

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

o: No statistically significant difference.
+(++): Difference between SBP participants and nonparticipants is positive and significant at the .05(.01) level.
-(--): Difference between SBP participants and nonparticipants is negative and significant at the .05(.01) level.

2. Food Items Eaten at Breakfast

Table 2 provides a summary of the results of the food item analysis presented in Chapter V of this report. Two general findings emerge from the analysis of the breakfast food choices of SBP participants and nonparticipants. First, the breakfast foods consumed by SBP participants differ significantly from the foods consumed by SBP nonparticipants who eat breakfast. Specifically, SBP participants are generally more likely than SBP nonparticipant breakfast eaters to consume milk products, citrus juices, other fruit, and pancakes or the like at breakfast and are less likely to consume eggs, butter and margarine, and, for some subgroups, dry/prepared cereals. Second, except for milk products and a few less commonly reported breakfast foods, SBP participants have significantly lower average quantities consumed of the breakfast food items than nonparticipants, even for those foods consumed by proportionately more SBP participants.

These findings from the analysis of the food items consumed at breakfast are, for the most part, consistent with the general nutrient intake findings discussed above. That is, the nutritional benefits of the SBP with respect to higher intakes of calcium and lower intakes of cholesterol for SBP participants can be attributed to the higher percentage of SBP participants consuming milk and the lower percentage consuming eggs relative to nonparticipants who eat breakfast. The lower intake of iron for SBP participants relative to nonparticipant breakfast eaters is consistent with a lower percentage consuming and a smaller average quantity consumed of dry/prepared cereals. On the other hand, it is important to note that although SBP participants generally consume lower quantities of breakfast foods than do nonparticipants, the nutrient intake findings show almost no significant relationships between SBP participation and the intake of food energy.

Table of Contents

TABLE 2

SUMMARY OF FOOD ITEM ANALYSIS: DIFFERENCES IN PERCENTAGES CONSUMING AND AVERAGE QUANTITIES CONSUMED BETWEEN SBP PARTICIPANTS AND NONPARTICIPANTS

	Students 5 to 10 Years of Age				Students 11 to 14 Years of Age				Students 15 to 21 Years of Age			
	Male		Female		Male		Female		Male		Female	
	Percent Eating Food Item	Average Quantity Consumed	Percent Eating Food Item	Average Quantity Consumed	Percent Eating Food Item	Average Quantity Consumed	Percent Eating Food Item	Average Quantity Consumed	Percent Eating Food Item	Average Quantity Consumed	Percent Eating Food Item	Average Quantity Consumed
Milk	++	++	0	++	0	0	0	0	-	0	+	++
Chocolate Milk	++	--	++	0	++	--	++	--	++	0	0	++
Eggs	-	--	0	--	--	--	--	--	0	0	-	++
Meats	0	++	0	--	0	0	0	0	0	--	0	0
Sausage	0	--	+	--	++	--	++	--	0	--	0	++
Citrus Juices	++	--	++	--	++	--	0	--	0	--	+	--
Citrus Fruits	0	0	0	0	0	--	0	++	0	0	0	0
Other Fruit	++	0	++	0	++	0	0	--	0	--	0	0
Butter & Margarine	-	--	--	--	--	--	--	0	+	0	0	--
Bacon	0	--	0	--	0	--	0	--	0	--	0	--
Dry/Prepared Cereals	0	--	-	--	0	--	0	--	-	--	-	--
Cooked Cereals	0	--	0	--	0	--	0	--	0	--	0	--
Breads & Toast	0	--	0	0	0	--	0	0	0	--	0	--
Pancakes, Muffins, Coffee Cake, etc.	++	--	++	--	++	--	++	--	++	--	++	0
Cake or Cookies	0	--	0	--	0	--	0	--	0	--	0	--
Sugars, Syrups	0	--	0	0	0	0	0	0	+	+	0	++
Peanut Butter	0	0	0	--	0	++	0	--	0	++	0	0

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

0: No statistically significant difference.
+(++): Difference between SBP participants and nonparticipants is positive and significant at the .05(.01) level.
-(--): Difference between SBP participants and nonparticipants is negative and significant at the .05(.01) level.

II. DATA AND ANALYTIC APPROACH

The analysis approach for our study of the nutritional effects of the SBP involves a comparison of SBP participants and nonparticipants with respect to the likelihood of eating any breakfast, nutrient intake at breakfast and over 24 hours, the likelihood of meeting the RDA, and the types and quantities of foods eaten at breakfast. The data used for the analysis are from the surveys conducted during the 1980-81 school year as part of NESNP-1. This chapter describes the data and sample selection criteria used for this study of the SBP and presents our methodological approach to the analysis topics discussed in Chapter I.

A. DESCRIPTION OF DATA[1]

The data collection efforts under NESNP-1 included three major surveys:

1. The Cross-Sectional Survey of Students, which used personal interviews and in-school assessments to provide data on 6,556 students in grades 1-12
2. The Household Survey of Parents, which used household interviews to produce data on the families of the 6,556 students interviewed
3. The Food Administrator Survey, which used mail questionnaires to collect data on 1,107 public schools districts and 50 states plus the District of Columbia

For this study, data from the Cross-Sectional Survey of Students (CSS) and the Household Survey of Parents (HSP) are used to analyze the nutritional effects of the SBP. The data collected directly from the students in the

---

[1] A more detailed discussion of the NESNP-1 data is included in Chapter 2 of Volume I of the NESNP-1 Final Report (Wellisch et al., 1983a). Indeed, this section of our report borrows heavily from that chapter.

CSS include a complete record of all foods eaten in the last 24 hours (24-hour dietary recall), anthropometric measurements, background information (age, sex, grade in school, race, etc.), and information on participation in USDA school nutrition programs. The data collected from parents in the HSP include background information such as family income, family size and composition, and family food expenditures.

To collect the information on students and their families, a three-stage stratified sample design was used. First, school districts were stratified by poverty level and then sampled within strata; second, public schools were stratified by grade level and then sampled within the selected districts; and finally, students were sampled within the chosen public schools. Students were actually sampled for the CSS in two steps. In the first step, approximately 25 eligible students per grade were sampled and parental permission was requested for student participation. Subsequently, eight students and two alternates per grade were selected from among those with parental permission for participation in the survey.

In addition to the representative sample of school districts and public schools, as described above, an additional supplemental sample of seven school districts containing schools that do not provide USDA school lunches was also drawn to provide a comparison group for schools participating in the NSLP. Ultimately, the sampling strategy provided data on 6,556 students, consisting of 5,977 students from the representative sample and 579 students from the supplemental sample of no-lunch schools.

Of the 6,556 students who participated in NESNP-1 and for whom some data are available, the 579 students from the supplemental no-lunch sample have no value for the sample weight variable in the original files. Because this study requires using the sampling weights to compute descriptive statistics for the population represented by the NESNP-1

sample, cases with missing weights are omitted from the descriptive analyses. In addition, of the 5,977 cases with valid sampling weights, 237 are missing data on nutrient intake and are thus also excluded from the analysis. With these exclusions, the data file for the descriptive analyses contains 5,740 cases with complete data on nutrient intake and SBP participation status.[1]

The nutrient intake variables used in this study were constructed from the reported dietary intakes of students obtained from a 24-hour recall. The 24-hour recall interview was conducted at school for students in grades 3 through 12 and at home with an adult present for children in grades 1 and 2. Students reported the type and amount of food they ate during the 24 hours preceding the interview, with probes by the interviewer to help the children remember all the foods eaten. Information on the type and quantities of food was converted to their nutrient equivalents using the Highland View Hospital-Case Western Reserve University (HVH-CWRU) nutrient data base. The HVH-CWRU data base contains data on the nutrient content of over 2,000 individual food items. Nutrient values are updated continuously from published studies on food consumption.

One important feature of the NESNP-1 data files to highlight is the manner in which the RDA were assigned to students. To summarize briefly, the RDA for food energy on the file is based on a student's desired weight for given height, sex, and age groupings, and the RDA for thiamin, riboflavin, and niacin are based on the daily intake of calories. The RDA for the remaining micronutrients are based on those established by the National Research Council and are average population values for age and sex

---

[1] Cases with missing sample weights were not excluded from the multivariate analyses.

groupings. A problem with this combination of individualized and population average RDA is that the use of the population table values for the RDA for vitamin B_6 is inconsistent with using individualized values for thiamin, niacin, and riboflavin, which are also B vitamins. Consequently, for our analysis, the RDA for vitamin B_6 is reassigned based on the individual's intake of protein and is defined to be .02 milligrams of vitamin B_6 per gram of protein intake (NRC, 1980). The remaining micronutrients examined--vitamin A, iron, calcium, and magnesium--have RDA based on the table values published for age and sex groupings by the National Research Council. However, one additional problem with the NESNP-1 data files is that the table values of the RDA for these nutrients are assigned on the basis of a student's rounded age, rather than the actual age. For this study, we reassigned the RDA based on students' actual ages.

B. METHODOLOGY

The overall objective of the analyses presented in this study is to obtain unbiased estimates of the effects of the SBP on a variety of dietary outcome measures. Given the research design of NESNP-1, we develop and estimate models of dietary impacts of the SBP in this report that attempt to satisfy this objective. Data on nutrient intake of SBP participants and nonparticipants, as well as data on the characteristics of students and their families, are used to estimate these models. This section discusses our general analytic strategy and the strengths and limitations of our approach.

NESNP-1 had a nonexperimental research design. That is, rather than being randomly selected to receive or not to receive school breakfasts, students eligible to participate in the SBP chose whether or not to participate in the program. When a program evaluation has a

nonexperimental research design, a simple estimator of the program's impact, such as the difference between program participants and nonparticipants in the mean value of an outcome measure (e.g., the intake of a nutrient), may be biased. This bias arises from the fact that program participants may have values for the outcome measure that differ from those of eligible nonparticipants for reasons not attributable to the program. For example, SBP participants may have lower nutrient intakes over 24 hours than nonparticipants because they are economically not as well-off as nonparticipants or because of differences in awareness of nutritional needs.

Because SBP participants and nonparticipants differ in ways other than their SBP participation status that may also affect the dietary outcome measures examined, it is necessary to control for such differences in order to obtain unbiased estimates of program impacts. Most of the analyses presented in this study use some type of multivariate analysis procedure to provide such unbiased estimates of the relationship between SBP participation and a number of dietary outcome measures.[1] The basic multivariate analysis procedure used is multiple regression analysis.[2] For a correctly specified model of the determinants of specific dietary outcomes, multiple regression procedures provide unbiased estimates of the

---

[1] The exception is the analysis of breakfast food items consumed, which is based on a descriptive analysis of the food choices of SBP participants and nonparticipants.

[2] An additional multivariate analysis procedure used in this study is probit. Probit is used when the outcome variable being analyzed is dichotomous (e.g., whether or not a student eats breakfast). While probit and multiple regression are quite different analysis techniques and are appropriate in different situations, the general description of the advantages and shortcomings of multiple regression contained in this section apply to probit as well.

effects of the SBP, while controlling for the effects of a number of student and household characteristics that are also hypothesized to influence dietary outcomes and that may also be associated with SBP participation.

The ability of multiple regression to isolate the effects of SBP participation from other factors that also influence dietary outcomes makes it a powerful analysis tool. However, our ability to control for factors other than SBP participation that also influence dietary outcomes is limited by the student and household characteristics that were measured in the NESNP-1 surveys and by a fundamental inability to measure some differences between SBP participants and nonparticipants that are likely to influence dietary outcomes, such as awareness of nutritional needs and motivation to attain a sound diet. Because the effects of such factors that are correlated with SBP participation may not be entirely controlled for, even regression estimates of the effects of the SBP may be misleading. This possibility suggests that caution should be exercised in interpreting our regression estimates of SBP effects; those estimates may incorporate true program effects as well as effects of other unmeasured differences between SBP participants and nonparticipants that influence the various dietary outcome measures.

III. IMPACT OF THE SCHOOL BREAKFAST PROGRAM ON FOOD ENERGY AND MICRONUTRIENT INTAKE

This chapter presents the results of the re-analysis of the NESNP-I nutritional data. There are three components to the re-analysis: (1) an analysis of the decision to eat any breakfast, (2) an analysis of food energy and micronutrient intake at breakfast, and (3) analyses of food energy and micronutrient intake over 24 hours and the likelihood of achieving the RDA over 24 hours.

A. SUMMARY OF FINDINGS

The results of the analysis of the impact of the SBP on the decision to eat breakfast and on food energy and micronutrient intake show numerous program impacts. This section both provides an overview of these findings and a summary of specific findings.

1. Overview of Findings for Food Energy and Micronutrient Intake

On net, the specific findings discussed below and in more detail in this chapter suggest that the SBP has mixed effects on food energy and micronutrient intake. Four general findings from the analysis reported in this chapter can be summarized. First, the results of this study indicate that the likelihood of eating any breakfast is not related to the availability of the SBP. Second, calcium intake and the likelihood of meeting the RDA for calcium are, in general, positively associated with participation in the SBP, particularly for students 15 to 21 and 5 to 10 years of age. Third, except for the older teenagers, iron intake at breakfast is negatively related to participation in the SBP, although the likelihood of meeting the RDA for iron does not appear to differ for SBP

participants and nonparticipants. Finally, some negative relationships between nutrient intake and SBP participation are estimated for vitamins B_6 and A.

2. Summary of Specific Findings on Food Energy and Micronutrient Intake

Results from the descriptive and multivariate analyses of the decision to eat any breakfast suggest that the availability of the SBP is not related to the likelihood of eating breakfast. This result is based on an analysis of whether students ate any breakfast or pre-breakfast foods during the 24-hour period of the dietary recall component of the NESNP-I survey. It is observed for both the entire analysis sample and for students from households with gross income less than 185 percent of the poverty level.[1]

With respect to participation in the SBP, the participation rate is highest for students 5 to 10 years of age (10-11 percent) and lowest for students 15 to 21 years of age (4-5 percent).[2] The very low SBP participation rate for older teenagers and resulting small sample sizes severely constrain the ability of the specified model to detect many significant effects of the SBP for this age group.

For students 5 to 10 years of age, participation in the SBP is associated with greater intakes at breakfast of food energy, calcium, and

---

[1] The choice of 185 percent of the poverty level as the income level to define low-income households is because students from households with income below this level are currently eligible for free or reduced-price breakfasts.

[2] The SBP participation rate in this analysis is the participation rate of all students, not the participation rate of students attending schools that have a SBP.

magnesium and with a lower intake of iron. Over 24 hours, most effects of the SBP are attenuated--the positive relationships between SBP participation and the intake of food energy, calcium, and magnesium at breakfast become insignificant over 24 hours; the insignificant relationship with the intake of vitamin A at breakfast becomes negative over 24 hours; and the negative relationship with the intake of iron at breakfast becomes even more negative over 24 hours.

For students 11 to 14 years of age, SBP participants have significantly lower intakes of vitamin A and iron at breakfast and a significantly higher intake of calcium relative to SBP nonparticipants who eat an alternative breakfast. Over 24 hours, however, the positive relationship between SBP participation and calcium intake at breakfast is not maintained and negative relationships of SBP participation and nutrient intake are detected for the daily intake of food energy and vitamin B_6. However, the negative relationships between SBP participation and the intake of vitamin A and iron at breakfast do not persist in the total day assessments.

For students 15 to 21 years of age, SBP participation is associated with a higher intake of calcium both at breakfast and over 24 hours. No other significant relationships between SBP participation and nutrient intake are detected for this age group.

Three principal findings emerge from the analysis of whether students meet the RDA over a 24-hour period. First, for the youngest and oldest age group, the probability of achieving the RDA for calcium is positively associated with SBP participation. Second, the likelihood of

meeting the RDA for vitamin B_6 is negatively associated with SBP participation for students ages 11 to 14 and 15 to 21. Finally, the likelihood of meeting the RDA for vitamin A for students 5 to 10 years of age is negatively related to SBP participation.

B. THE DECISION TO EAT ANY BREAKFAST

Two important findings of the NESNP-1 analysis are that approximately 12 percent of public school students do not eat any breakfast and that one of the major nutritional benefits of the SBP is that it increases the likelihood that students will eat a breakfast. One implication of these findings is that eating a breakfast is itself a decision that students or their families make. The purpose of the analysis of the decision to eat breakfast presented in this section is to examine in a systematic manner both the incidence of breakfast skipping and the determinants of the decision to eat breakfast.

Table 3 presents descriptive data on weighted and unweighted sample sizes by age, sex, and SBP participation. Participation in the SBP is highest among students 5 to 10 years of age and lowest among students 15 to 21 years of age, although the maximum (weighted) participation rate is still only 11 percent for females 5 to 10 years of age. An opposite pattern by age is observed for the incidence of skipping breakfast. Only 5-6 percent of the students 5 to 10 years of age skipped breakfast, while 17 percent of males and 25 pe cent of females 15 to 21 years of age skipped breakfast. In addition, for the two older age groups, females appear much more likely to be breakfast skippers than males.

One other aspect of Table 3 that is important to note is the small sample size for the SBP participant groups for the two older age groups.

Table of Contents

TABLE 3

WEIGHTED AND UNWEIGHTED
SAMPLE SIZES FOR SCHOOL BREAKFAST ANALYSIS

Target Group		Sample Size			
		Unweighted		Weighted	
		N	%	N	%
5-10 Years Old					
Male:	SBP Participant	159	14%	.67m	10%
	Non-USDA Breakfast	931	80%	5.68m	85%
	No Breakfast	74	6%	.33m	5%
Female:	SBP Participant	162	14%	.70m	11%
	Non-USDA Breakfast	902	79%	5.62m	83%
	No Breakfast	80	7%	.43m	6%
		2,308			
11-14 Years Old					
Male:	SBP Participant	98	10%	.41m	7%
	Non-USDA Breakfast	754	80%	5.03m	83%
	No Breakfast	89	10%	.65m	11%
Female:	SBP Participant	76	8%	.35m	6%
	Non-USDA Breakfast	733	78%	4.69m	80%
	No Breakfast	132	14%	.85m	14%
		1,882			
15-21 Years Old					
Male:	SBP Participant	39	5%	.22m	4%
	Non-USDA Breakfast	612	79%	4.40m	79%
	No Breakfast	120	16%	.93m	17%
Female:	SBP Participant	28	4%	.19m	3%
	Non-USDA Breakfast	554	71%	4.08m	72%
	No Breakfast	197	25%	1.39m	25%
		1,550			

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: The sample sizes and percents are based upon data from all students with sampling weights and nutrient intake data, regardless of whether the SBP was or was not available in the schools they attended.

In particular, of the 771 males 15 to 21 years of age only 39 are SBP participants and of the 779 females 15 to 21 years of age only 28 are SBP participants. Such small sample sizes severely limit the ability of an analysis, no matter how carefully modeled and estimated, to detect statistically significant program impacts.

To examine how the likelihood of eating any breakfast varies with the availability of the SBP, Table 4 presents descriptive data on the percent of students eating any breakfast by age, sex, and SBP availability for all students and for students from low-income households.[1] These data suggest that, although there are differences across the age/sex categories in the percent eating any breakfast, there are very few differences between students with the SBP available and students without the SBP available in the percent eating any breakfast. The exception to this is for females 11 to 14 years of age, where students with the SBP available actually appear less likely to eat breakfast than students without the SBP available.

These descriptive findings are supported further by the results presented in Table 5, which shows the probit equations estimated for the probability of eating any breakfast.[2] For all three age groups, the coefficient on SBP availability is not significantly different from zero, indicating that the likelihood of eating breakfast does not vary for students with and without the SBP available.

---

[1] Low-income households have gross income less than 185 percent of the poverty level and correspond to households currently eligible for free or reduced-price breakfasts.

[2] Probit is a maximum likelihood estimation procedure used to estimate equations with dichotomous dependent variables.

Table of Contents

TABLE 4

DESCRIPTIVE DATA ON PERCENT EATING ANY BREAKFAST

Target Group		All Households			Households with Gross Income Less Than 185% of Poverty Level		
		Unweighted Sample Size	Weighted Sample Size	Percent Eating Any Breakfast	Unweighted Sample Size	Weighted Sample Size	Percent Eating Any Breakfast
5-10 Years Old							
Male:	SBP Available	470	2.70m	95%	244	1.24m	94%
	SBP Not Available	694	3.98m	95	269	1.37m	94
Female:	SBP Available	509	2.93m	92	295	1.43m	92
	SBP Not Available	635	3.83m	95	217	1.16m	93
11-14 Years Old							
Male:	SBP Available	390	2.41m	90	193	.89m	86
	SBP Not Available	551	3.68m	88	194	1.13m	89
Female:	SBP Available	368	2.18m	82	210	1.08m	82
	SBP Not Available	573	3.71m	88	215	1.12m	85
15-21 Years Old							
Male:	SBP Available	264	1.81m	84	130	.55m	83
	SBP Not Available	507	3.73m	83	131	.78m	81
Female:	SBP Available	264	2.01m	75	127	.55m	75
	SBP Not Available	515	3.66m	76	174	.91m	75
		5,740			2,399		

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Percent eating any breakfast is based on weighted data.

Table of Contents

TABLE 5

PROBIT EQUATIONS FOR THE PERCENT EATING ANY BREAKFAST
(Standard errors in parentheses)

Explanatory Variable	5-10 Years Old	11-14 Years Old	15-21 Years Old
Constant	1.065** (.227)	1.151** (.198)	.657** (.187)
SBP Availability	.078 (.088)	.068 (.081)	.025 (.108)
On Diet	.360 (.203)	-.232 (.131)	-.241* (.108)
Male	.060 (.080)	.236** (.075)	.318** (.073)
Black	-.252* (.105)	-.357** (.099)	-.300* (.098)
Hispanic	-.026 (.144)	-.251 (.131)	-.336** (.127)
Adult at Home During Breakfast	.093 (.149)	.038 (.134)	.178 (.120)
Female Head Completed High School	.302** (.095)	-.125 (.090)	.032 (.085)
Female Head Completed College	.663** (.205)	.368** (.142)	.421** (.140)
Female Head Employed	-.237** (.083)	-.341** (.078)	-.074 (.077)
Household has Male and Female Head	.087 (.107)	-.013 (.104)	.155 (.970)
Family Size	.036 (.026)	.018 (.022)	-.010 (.021)
Monthly Household Income (in 100's)	.005 (.034)	.002 (.003)	-.005* (.002)
N	2,503	2,018	1,639
-2*Log LF	58.565	40.180	70.596

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: These equations were estimated using probit.

*(**): Significant at the .05(.01) level, two-tailed test.

It is important to recall that the definition of breakfast in this analysis differs from that used in the NESNP-1 analysis. Specifically, breakfast in this study includes all breakfast and pre-breakfast foods, whereas in NESNP-1, breakfast included only foods eaten at a meal respondents defined as breakfast. Of the 7.5 percent of the total sample that reported eating pre-breakfast snacks, 4.1 percent had no other breakfast foods and would have been considered breakfast skippers in NESNP-1. Further, although a higher percentage of SBP participants than nonparticipants consumed pre-breakfast foods, most (93 percent) of the SBP participants eating pre-breakfast foods also consumed other breakfast foods, while only 30 percent of the nonparticipants eating pre-breakfast foods also consumed other breakfast foods.[1] These findings suggest that the impact of revising the definition of breakfast is to include proportionately more SBP nonparticipants as breakfast eaters, which is, in turn, likely to lead to a smaller estimated effect of SBP availability on the likelihood of eating breakfast relative to the NESNP-1 analysis which used a more restrictive definition of breakfast.

The other results presented in Table 5 suggest that socioeconomic characteristics are significant predictors of the probability of eating any breakfast. In particular, the education and employment status of the

---

[1] These figures are from tabulations based upon data from NESNP-1, as follows:

	SBP Participants	SBP Nonparticipants	Total Sample
Percent Eating Pre-Breakfast Foods	15.84%	6.46%	7.51%
No other breakfast foods	1.07	4.53	4.14
With other breakfast foods	14.77	1.97	3.37

female head are highly significant predictors of the likelihood of eating breakfast. Children living in households where the female head has completed college are significantly more likely to eat breakfast than children in households where the female head has less than a high school education. In addition, for 5 to 10 year olds, female heads who have completed high school are more likely to have children who eat breakfast than do female heads with less than a high school education. With respect to employment status of the female head, for the two younger age groups the likelihood of eating breakfast is significantly less in households where the female head is employed.

Other important predictors of the likelihood of eating any breakfast are race, ethnicity, and sex. For all three age groups, blacks are less likely than whites to eat breakfast, and for the oldest age group, Hispanic students are less likely than whites to eat breakfast. Finally, except for the youngest age group, males are much more likely to be breakfast eaters than females.

To summarize briefly, results from both the descriptive and probit analyses of the likelihood of eating breakfast suggest that the availability of the SBP has virtually no relationship with whether or not students eat any breakfast. However, other socioeconomic factors are significant predictors of the likelihood of eating any breakfast, most notably the education and employment status of the female head, sex, race, and ethnicity.

C. FOOD ENERGY AND MICRONUTRIENT INTAKE AT BREAKFAST

1. Model

The basic analysis of nutrient intake at breakfast builds on the analysis of the decision to eat breakfast that was discussed above. That is, the decision to eat breakfast is treated as an endogenous decision that

students or their families make and nutrient intake at breakfast is specified as being conditional on students eating breakfast.

Formally, the econometric model estimated is the following:

$$(1) \quad NI_i = X_i \beta + \alpha SBP_i + \varepsilon_i \text{ if } P_i = 1$$
$$= 0 \text{ if } P_i = 0$$

$$(2) \quad P_i = 1 \text{ if } P_i^* = Z_i \delta + u_i > 0$$
$$= 0 \text{ if } P_i^* = Z_i \delta + u_i \leq 0,$$

where

NI_i = nutrient intake at breakfast of the ith student

X_i = variables influencing nutrient intake at breakfast

SBP_i = dichotomous variable denoting participation in the SBP (1 = yes, 0 = no)

P_i = dichotomous variable denoting whether the student eats breakfast (1 = yes, 0 = no)

P_i^* = unobserved latent variable underlying the decision to eat breakfast

Z_i = variables influencing the decision to eat breakfast, one of which is SBP availability

ε_i, u_i = random disturbance terms

Assumptions regarding the random disturbance terms are:

$$\varepsilon_i \sim N(0, \sigma^2)$$

$$u_i \sim N(0,1)$$

$$\text{cov}(\varepsilon_i u_i) = \begin{bmatrix} \sigma^2 & \sigma_{\varepsilon u} \\ \sigma_{\varepsilon u} & 1 \end{bmatrix}$$

The statistical procedure used to estimate this model is a two-stage procedure proposed by Heckman (1979). The first stage involves estimating the breakfast equation (equation 2) using probit, based on all observations. The probit estimates are then used to construct the inverse of the Mills ratio (Heckman's "lambda"), which is used in the second stage to obtain consistent estimates of the nutrient intake equations.

This model is appealing for two reasons. First, it recognizes that the decision to eat breakfast is an endogenous choice that is potentially correlated with the other independent variables influencing nutrient intake, and under plausible assumptions, it controls statistically for the endogeneity, thereby providing consistent estimates of the nutrient intake equations. Second, this model recognizes explicitly that there are two components to the nutritional impact of the SBP--the nutrient contribution of school breakfasts vis-a-vis alternative breakfasts and the increased likelihood that a child will eat any breakfast at all.[1]

In addition to the basic statistical model of the decision to eat breakfast and the nutritional effects of the SBP depicted in equations (1)-(2), there are several other differences between the model of nutrient intake at breakfast estimated for this report and the NESNP-1 model of nutrient intake at breakfast. First, as discussed previously, breakfast is redefined so as to include both breakfast foods and pre-breakfast foods,

---

[1] However, as shown in Tables 4 and 5 and discussed above, the likelihood of eating breakfast does not vary for students with and without the SBP available, suggesting that the estimated effect of SBP participation may not depend on whether the decision to eat breakfast is incorporated into the model of nutrient intake. Nevertheless, the first reason for incorporating the decision to eat breakfast in the nutrient intake analysis is compelling, since other factors affecting the decision to eat breakfast are likely to affect nutrient intake as well (e.g., sex, race, and ethnicity).

whereas in the NESNP-1 analysis breakfast included only foods eaten at a meal respondents defined as breakfast.

A second revision to the NESNP-1 analysis is to use a single dummy variable for whether the student participated in the SBP, in contrast to the NESNP-1 analysis in which seven dummy variables representing different combinations of participation in the SBP, NSLP, and SMP were included in the regressions. This revision makes it much easier to assess the impact of the SBP on nutrient intake and it avoids the somewhat non-intuitive presence of all seven program participation variables in every nutrient regression for breakfast, lunch, and over 24 hours.

Another important difference between this study and NESNP-1 concerns the range of dietary outcome measures analyzed. As discussed in Chapter I of this report, NESNP-1 was a comprehensive evaluation of three school nutrition programs and examined 106 different dietary outcome measures. This study is focused more narrowly on learning more about the dietary effects of the SBP and is not intended to be a complete re-analysis of the NESNP-1 models of nutrient intake. For this chapter, in which some re-analysis of the NESNP-1 nutritional data is undertaken, the dietary outcome measures analyzed are fewer in number and are less complex than in NESNP-1. Specifically, we examine the intake of food energy and five micronutrients at breakfast, food energy and micronutrient intake over 24 hours, and the likelihood of achieving the RDA over 24 hours. In contrast, NESNP-1 examined a more expansive set of micronutrients and analyzed both

absolute nutrient intake levels and a large number of dietary outcomes measuring diet quality.[1]

The final revision to the NESNP-1 model is to streamline the set of control variables included in the nutrient intake regression equations in order to include those variables thought to be most relevant. The following variables are included in the nutrient intake regressions:

- SBP participation, a binary variable equal to one if the respondent eats any USDA foods for breakfast and equal to zero otherwise
- Black, a binary variable equal to one if the respondent is black and equal to zero otherwise
- Hispanic, a binary variable equal to one if the respondent is Hispanic and equal to zero otherwise
- Male, a binary variable equal to one if the respondent is male and equal to zero otherwise
- Female head is employed, a binary variable equal to one if the respondent lives in a household with a female household head that is employed and equal to zero otherwise
- Female head completed high school, a binary variable equal to one if the respondent lives in a household with a female household head who completed high school and equal to zero otherwise
- Female head completed college, a binary variable equal to one if the respondent lives in a household with a female household head who completed college and equal to zero otherwise
- North Central, a binary variable equal to one if the respondent lives in the North Central region and equal to zero otherwise
- South, a binary variable equal to one if the respondent lives in the South and equal to zero otherwise

---

[1] It is interesting that, despite the large number of dietary outcomes considered in NESNP-1, no analysis of the likelihood of students meeting the RDA was conducted. Such an analysis is presented in this report (Section D of this chapter).

- West, a binary variable equal to one if the respondent lives in the West and equal to zero otherwise
- Family size, a continuous variable denoting number of family members
- Monthly household income (in 100's), a continuous variable[1]
- Urban, a binary variable equal to one if the respondent lives in an urban area and equal to zero otherwise
- Suburban, a binary variable equal one if the respondent lives in a suburban area and equal to zero otherwise
- On diet, a binary variable equal to one if the respondent is on a diet and equal to zero otherwise

Appendix Table D.1 presents sample summary statistics for these independent variables.

Although these variables constitute only a subset of those considered in NESNP-1, a careful review of the variables included in NESNP-1, both with respect to their theoretical justification and their statistical significance in the NESNP-1 analyses, resulted in the choice of these variables. One important independent variable used in NESNP-1 that was excluded from this study is age of the respondent. The reason for excluding age as an independent variable in our analysis is because we stratified our sample into three age groups (5 to 10 years, 11 to 14 years, and 15 to 21 years), whereas NESNP-1 used only two age groupings (elementary and secondary subsamples). As a result, students in our age

---

[1] NESNP-1 included both an income variable and food expenditure variable as predictors of nutrient intake. Neither of these two variables were significant predictors of nutrient intake at breakfast (see Tables 7A-50 and 7A-53, Wellisch et al., 1983b). Because of the probable multicollinearity between household income and food expenditures, we chose to include only household income in this study. An alternative model was estimated that included household food expenditures rather than income as an independent variable. While neither of these variables are strong predictors of nutrient intake, our results show that household income is marginally more significant than household food expenditures.

groups are more homogeneous with respect to age than in NESNP-1. Our choice of three age groupings rather than two reflects our judgment that the dietary habits differ so significantly by age that it is necessary to estimate separate models of dietary impacts for students of different ages and that the secondary school subsample used in NESNP-1 includes considerable variation in students' ages. In addition, except for the oldest age group, our age categories were chosen to correspond roughly to the age groupings used by the National Research Council to set the RDA.

2. Nutrients Examined

In order to focus more specifically on the most important nutritional impacts of the SBP, the dietary components examined in the multivariate analysis are limited to food energy, vitamin B_6, vitamin A, iron, calcium, and magnesium. Two factors explain the choice of these six dietary components : (1) these nutrients generally have the lowest average intake levels and the lowest percentage meeting the RDA for school-age children;[1] and (2) these nutrients are the ones found to vary most by SBP participation status in the NESNP-1 analyses.

The importance of these nutrients can be recognized further by summarizing their major physical functions. For the six nutrients examined in the multivariate analyses, the following is a brief summary of their major functions:[1]

---

[1] These nutrients are also those for which the lowest percentage of adults and the population as a whole attain the RDA (USDA, HNIS, May 1984). Appendix A presents descriptive tables showing the percent of students by age and sex meeting the RDA, based on the NESNP-1 data.

[2] The following discussion is borrowed heavily from Appendix III of Caloric and Selected Nutrient Values for Persons 1-74 Years of Age: First Health and Nutrition Examination Survey, United States, 1971-74, U.S. Department of Health, Education, and Welfare, National Center for Health Statistics, Series 11, Number 209, June 1979, and from Recommended Dietary Allowances, National Research Council, ninth revised edition, 1980.

1. Food energy, which is derived from nearly all foods, is essential for growth and development, basal metabolism, and physical activity.

2. Vitamin B_6 is a coenzyme that is necessary for protein and amino acid metabolism.

3. Vitamin A is necessary for the maintenance of healthy skin and mucous membranes and for normal vision at night. In addition, vitamin A helps in resisting infections.

4. Iron is essential for the formation of hemoglobin, the oxygen-carrying pigment of red blood cells.

5. Calcium is necessary for the formation and maintenance of bones and teeth, and it is a factor in blood coagulation and normal reactions of nerve and muscle tissue.

6. Magnesium is an essential part of many enzyme systems and is important in maintaining electrical potential in nerves and muscle membranes.

3. Results For Food Energy and Micronutrient Intake at Breakfast.

Tables 6-8 present the regression equations for nutrient intake at breakfast. For children aged 5 to 10 years, participating in the SBP is associated with significantly higher intakes of food energy, calcium, and magnesium and a significantly lower intake of iron (Table 6). The coefficients of SBP participation in the equations for vitamins B_6 and A are not statistically different from zero, suggesting the SBP has little, if any, impact on the intake of these nutrients at breakfast. For 11 to 14 year olds, significant negative relationships between SBP participation and the intake at breakfast of vitamin A and iron and a significant positive relationship for the intake of calcium are found (Table 7). Finally, for children 15 to 21 years of age, SBP participation is associated with a significantly higher intake of calcium at breakfast and no difference in the intake of the remaining dietary components (Table 8).[1]

---

[1] As discussed previously, the ability of our nutrient intake equations to detect statistically significant program impacts for students 15 to 21 years of age is severely limited by the small number of SBP participants of this age in the sample.

Table of Contents

TABLE 6

EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N=2,337)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	376.07**	211.06	1,230.89**	1.986**	245.25**	35.00*
	(64.36)	(125.92)	(370.67)	(.745)	(57.05)	(9.57)
SBP Participation	**30.93***	**-32.78**	**-142.73**	**-.578****	**98.27****	**11.65****
	(15.12)	**(28.94)**	**(95.06)**	**(.188)**	**(13.79)**	**(2.43)**
Black	55.19*	-140.42**	-81.18	-.353	1.02	-2.91
	(22.47)	(44.01)	(128.90)	(.259)	(19.90)	(3.33)
Hispanic	-1.90	-68.53	-35.43	-.260	-3.28	-1.83
	(20.48)	(40.59)	(110.89)	(.225)	(17.83)	(2.89)
Male	48.74**	65.66**	200.05**	.434**	42.48**	7.80**
	(11.61)	(23.09)	(61.75)	(.126)	(10.06)	(1.61)
Female Head is Employed	2.69	-101.05**	-227.54*	-.397	4.37	-2.35
	(18.34)	(36.19)	(101.50)	(.205)	(16.07)	(2.63)
Female Head Completed High School	-25.24	61.93	-15.30	.113	-14.66	.85
	(24.11)	(47.36)	(136.33)	(.275)	(21.25)	(3.53)
Female Head Completed College	-17.08	67.52	90.11	.360	-13.84	4.74
	(30.67)	(60.46)	(170.44)	(.345)	(26.90)	(4.42)
North Central	60.16**	90.74**	257.88*	.580**	53.08**	9.81**
	(16.99)	(32.62)	(105.52)	(.209)	(15.43)	(2.70)
South	45.01**	70.20*	183.43	.409*	29.59*	5.33*
	(16.23)	(31.22)	(100.13)	(.199)	(14.71)	(2.57)
West	54.14**	98.80**	333.06**	.560*	60.43**	10.88**
	(18.99)	(36.53)	(117.22)	(.233)	(17.21)	(3.00)
Family Size	-5.19	-1.45	-34.20	.016	-4.02	.14
	(4.35)	(8.61)	(23.75)	(.048)	(3.80)	(.62)
Monthly Household Income (in 100's)	-.07	.36	.22	-.0003	.07	.04
	(.46)	(.92)	(2.41)	(.005)	(.40)	(.06)
Urban	-11.76	11.35	-52.46	.083	-8.36	-.03
	(11.29)	(21.71)	(69.92)	(.139)	(10.25)	(1.79)
Surburban	-17.61	30.68	32.36	.046	-2.27	2.54
	(13.35)	(25.62)	(83.00)	(.165)	(12.13)	(2.13)
On Diet	-26.51	-38.66	-65.86	-.097	-30.67	-.18
	(28.34)	(56.22)	(152.45)	(.310)	(24.63)	(3.97)
Sample Selection Correction Factor	-360.21	779.45	175.53	1.823	-266.66	-18.82
	(263.05)	(513.35)	(1,531.68)	(3.071)	(233.97)	(39.51)
Mean of Dependent Variable	358 kcal	380 ug	1,211 IU	2.69 mg	246 mg	45 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 7

EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N=1,784)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	189.24*	368.30*	971.96*	2.352*	102.70	33.08*
	(92.93)	(159.39)	(484.69)	(1.032)	(76.04)	(15.44)
SBP Participation	**11.70**	**-65.03**	**-285.92***	**-.792****	**71.98***	**4.70**
	(22.31)	**(42.35)**	**(128.46)**	**(.273)**	**(19.44)**	**(4.07)**
Black	-31.78	-112.04	-217.45	-.517	-71.22*	-10.76
	(41.55)	(74.68)	(226.86)	(.482)	(34.98)	(7.21)
Hispanic	-64.89	-83.70	-302.76	-.619	-52.94	-11.80
	(37.56)	(64.13)	(195.04)	(.415)	(30.65)	(6.22)
Male	139.25**	129.39*	436.03**	1.121**	98.52**	16.88**
	(31.58)	(51.76)	(157.59)	(.336)	(25.16)	(5.03)
Female Head is Employed	-14.29	-5.79	-52.44	-.113	-6.31	-1.10
	(18.44)	(25.34)	(77.61)	(.167)	(13.38)	(2.50)
Female Head Completed High School	10.60	23.11	90.91	.178	19.17	3.05
	(23.98)	(36.36)	(110.98)	(.237)	(18.30)	(3.56)
Female Head Completed College	82.75*	71.62	290.81	.621	42.29	9.26
	(44.77)	(71.07)	(216.58)	(.463)	(35.03)	(6.93)
North Central	21.35	-20.87	-57.63	-.539*	51.22**	1.62
	(22.03)	(41.48)	(125.86)	(.267)	(19.09)	(3.99)
South	43.36*	-51.16	-159.65	-.291	50.84**	4.45
	(21.05)	(39.32)	(119.32)	(.253)	(18.15)	(3.79)
West	47.60	-45.60	14.99	-.036	82.11**	16.35**
	(24.75)	(46.31)	(140.51)	(.298)	(21.36)	(4.46)
Family Size	4.62	.88	29.10	.007	3.55	-.15
	(5.29)	(7.60)	(23.23)	(.050)	(3.93)	(.75)
Monthly Household Income (in 100's)	-.22	.65	2.00	.008	-.50	.002
	(.65)	(.87)	(2.66)	(.006)	(.47)	(.09)
Urban	-24.40	-21.39	-124.41	-.074	-10.97	-1.04
	(14.95)	(27.74)	(84.20)	(.179)	(12.84)	(2.67)
Surburban	-3.86	13.96	-68.22	.136	15.50	5.66
	(17.45)	(33.24)	(100.82)	(.214)	(15.24)	(3.20)
On Diet	-82.03	-75.82	-294.99	-.684	-33.05	-4.76
	(42.61)	(66.35)	(202.33)	(.432)	(32.99)	(6.48)
Sample Selection Correction Factor	531.02	5.03	448.91	1.478	276.43	23.93
	(358.14)	(630.45)	(1,915.80)	(4.075)	(297.65)	(60.96)
Mean of Dependent Variable	412 kcal	389 µg	1,275 IU	3.00 mg	270 mg	51 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 8

EQUATIONS FOR NUTRIENT INTAKE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N=1,304)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	351.91**	205.36	1,097.54**	2.790**	208.62**	37.68**
	(93.26)	(159.78)	(384.29)	(1.039)	(73.34)	(14.54)
SBP Participation	**45.56**	**-32.16**	**-94.11**	**-.532**	**133.70****	**11.92**
	(44.10)	**(72.17)**	**(181.73)**	**(.491)**	**(34.67)**	**(6.50)**
Black	-42.89	-131.31	-250.25	-.104	-50.26	-17.69**
	(44.48)	(76.14)	(183.27)	(.495)	(34.98)	(6.92)
Hispanic	-81.55	-175.09*	-353.99	.792	-41.34	-16.63*
	(50.18)	(86.28)	(206.78)	(.559)	(39.47)	(7.85)
Male	236.96**	262.08**	588.88**	1.649**	163.62**	32.81**
	(36.91)	(63.84)	(152.11)	(.411)	(29.03)	(5.82)
Female Head is Employed	-14.74	-24.60	8.58	-.275	-22.97	-4.00
	(21.86)	(38.40)	(90.08)	(.243)	(17.20)	(3.51)
Female Head Completed High School	-5.90	29.64	-10.62	.249	6.48	5.92
	(23.54)	(41.17)	(96.99)	(.262)	(18.51)	(3.76)
Female Head Completed College	-57.99	198.70*	450.45*	.188	.016	13.02
	(46.91)	(81.80)	(193.28)	(.522)	(36.89)	(7.47)
North Central	-33.77	5.84	-52.88	-.451	11.78	-10.59*
	(33.69)	(55.20)	(138.85)	(.375)	(26.49)	(4.97)
South	37.15	-103.65*	-196.45	-.592	6.46	-12.71**
	(30.60)	(50.17)	(126.09)	(.340)	(24.06)	(4.52)
West	6.14	-92.50	-137.08	-.874*	61.41*	-1.37
	(39.17)	(64.13)	(161.44)	(.436)	(30.80)	(5.77)
Family Size	-2.99	-9.66	-19.04	-.028	-5.10	-.51
	(5.47)	(9.58)	(22.53)	(.069)	(4.30)	(.86)
Monthly Household Income (in 100's)	1.44	.43	3.25	.014	.68	-.14
	(.81)	(1.40)	(3.33)	(.009)	(.64)	(.13)
Urban	-52.21*	-10.92	-76.37	-.141	-17.94	-3.34
	(22.81)	(37.42)	(93.10)	(.254)	(17.93)	(3.37)
Surburban	-42.42	43.36	35.92	.240	4.49	.18
	(27.04)	(44.24)	(111.45)	(.301)	(21.26)	(3.98)
On Diet	-50.78	-104.97	23.74	-.409	19.96	-5.21
	(39.76)	(68.92)	(163.82)	(.443)	(31.27)	(6.29)
Sample Selection Correction Factor	13.89	422.10	-1.46	-.172	-17.54	42.31
	(243.55)	(416.53)	(1,003.60)	(2.712)	(191.54)	(37.88)
Mean of Dependent Variable	448 kcal	362 ug	1,194 IU	3.09 mg	271 mg	51.96 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

An interesting finding shown by the results in Tables 6-8 is that the number of statistically significant relationship between SBP participation and nutrient intake declines across the three age groups. While this finding may simply be the result of SBP participation rates and, hence, sample sizes that decrease with age, this finding also has an implication for the overall effects of the SBP. In particular, for the youngest age group, which has the highest participation rate in the SBP and is, therefore, the most relevant for assessing program impacts, participation in the SBP is associated with higher intakes of food energy, calcium, and magnesium at breakfast and with a lower breakfast intake only of iron.

These findings provide some support for the findings from NESNP-1 in that participation in the SBP is generally associated with greater intakes of calcium, a lower breakfast intake of iron, and, for younger students, a higher intake of magnesium at breakfast. However, as shown in Tables 6-8 and discussed above, no statistically significant relationship between participation in the SBP and the intake of vitamin B_6 at breakfast is observed for any of the three age groupings, and a significant negative relationship between the breakfast intake of vitamin A and SBP participation is observed only for students 11 to 14 years of age. NESNP-1, on the other hand, found significant relationships between SBP participation and the breakfast intakes of vitamin B_6 and vitamin A for the elementary school subsample.[1]

With respect to the estimated effects of the other explanatory variables, the results suggest certain socioeconomic variables are significant predictors of nutrient intake. For all ages, males

---

[1] Appendix C of this report contains a table summarizing and contrasting the findings from this study and those from NESNP-1.

consistently have significantly higher intakes of all dietary components than females. For 5 to 10 year olds, the breakfast intakes of vitamin B_6, vitamin A, and iron are significantly lower for students from households where the female head is employed than for otherwise similar students, while for the two older age groups, no statistically significant relationship is estimated for the female employment variable. Conversely, female education has no significant relationship with nutrient intake at breakfast for the two youngest age groups, but has a positive and significant relationship with the breakfast intake of vitamin B_6, vitamin A, and magnesium for children 15 to 21 years of age. It is interesting that household income is generally not related to nutrient intake, although this result is also seen in the NESNP-1 analyses (see Tables 7A-50 and 7A-53 in Volume 2 of the NESNP-1 Final Report, Wellisch et al., 1983b).

One final comment on the results in Tables 6-8 is that the coefficients of the sample selection correction factors are consistently not statistically significant, suggesting that the correlation between the decision to eat breakfast and nutrient intake at breakfast is not different from zero. The implication of this result is that estimated equations for nutrient intake at breakfast probably would not be seriously biased if the decision to eat breakfast were ignored in the analysis of nutrient intake.[1]

---

[1]Basically, the insignificance of the sample selection correction factors is due to the fact that it is difficult to estimate an equation that predicts who will or will not eat breakfast and, hence, the correction factors in Tables 6-8 are imprecisely estimated. That is, although several variables are found to be significant predictors of the probability of eating breakfast (see Table 5), there is evidence that the explanatory power of these equations is fairly weak (that is, very low R^2 for similar ordinary least squares regression equations).

D. FOOD ENERGY AND MICRONUTRIENT INTAKE OVER 24 HOURS

The results presented in the previous section show the estimated relationship between participation in the SBP and nutrient intake at breakfast. However, a thorough assessment of the nutritional impacts of the SBP also should include a 24-hour nutritional analysis. This section presents our analysis of daily nutrient intake.

Two types of dependent variables are analyzed in the 24-hour analysis--nutrient intake over 24 hours and binary variables for whether the RDA are achieved over 24 hours. Both of these variables provide useful information on the relationship between nutrient intake and the SBP. The equations explaining daily nutrient intake show the relationship between SBP participation and the absolute intake of each nutrient, and the equations for whether the RDA are satisfied show the program's relationship to the nutritional adequacy of diets. Ordinary least squares (OLS) is the estimation procedure used to estimate the 24-hour nutrient intake equations,[1] and probit is the estimation procedure used to estimate the model of whether the RDA are satisfied.[2]

For the analysis of the RDA, it is important to note that the RDA are intakes of nutrients judged to be adequate for maintaining good

---

[1] Although the argument that the decision to eat breakfast is endogenous could apply to both the breakfast and 24-hour nutrient analyses, the implications are quite different. Unlike the breakfast equations, the 24-hour nutrient intake equations include a dummy variable for whether the student ate breakfast. If the decision to eat breakfast is endogenous, then OLS would lead to biased parameter estimates and instrumental variables estimation would be more appropriate (Maddala, 1977). However, given both the insignificant coefficients of the sample selection factors in the breakfast nutrient equations and the (related) difficulty in estimating precisely the determinants of the decision to eat breakfast, in addition to the computational difficulty of estimating a system of nutrient equations with an endogenous dummy variable, the estimation procedure used in the 24-hour nutrient analysis is ordinary least squares regression.

[2] Recall that probit is a maximum likelihood estimation procedure to estimate equations with dichotomous dependent variables.

nutrition in nearly all healthy persons in the United States and nutrient intakes less than the RDA do not necessarily imply dietary deficiencies or malnourishment. More explicitly, "Nutrient intakes below the RDA cannot be interpreted to mean individuals were malnourished since the RDA for nutrients are set high enough to meet the requirements for nearly all healthy individuals in the population. Thus, the RDA for nutrients will exceed the requirements of many individuals." (USDA, HNIS, May 1984).

In addition to the two types of dependent variables considered, the 24-hour analysis differs from the analysis of nutrient intake at breakfast discussed in the previous section in three ways. First, since daily nutrient intake is nonzero for breakfast skippers (as well as for lunch and dinner skippers), all skippers are included in the 24-hour analysis. Second, in order to control for skippers, as well as to assess the impacts of skipping a meal, three binary variables for whether the student ate breakfast, ate lunch, and ate dinner are included in the analysis. Finally, the 24-hour nutrient analyses include three binary program participation variables--SBP participation, NSLP participation, and SMP participation.[1]

1. Five to 10 Year Olds

Table 9 presents the results of estimating 24-hour nutrient intake regression equations for students 5 to 10 years of age. These results show no significant positive relationships between SBP participation and daily nutrient intake, and significant negative relationships between SBP participation and the daily intakes of vitamin A and iron.

---

[1] The differences between this study and NESNP-1 that were discussed previously in the context of nutrient intake at breakfast also apply to the 24-hour analyses of nutrient intake.

Table of Contents

TABLE 9

EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,503)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	1,012.60** (160.92)	448.12** (150.82)	-292.12 (1,054.22)	6.359** (1.160)	205.23* (103.79)	56.98* (18.35)
SBP Participation	**-82.77 (45.65)**	**-77.03 (42.79)**	**-599.44* (299.07)**	**-1.112** (.329)**	**48.84 (29.44)**	**.19 (5.21)**
NSLP Participation	-52.89 (33.07)	13.35 (31.00)	305.82 (216.68)	-.243 (.238)	98.89** (21.33)	-9.04* (3.77)
SMP Participation	165.80** (40.59)	105.00** (38.04)	434.22 (265.88)	.433 (.293)	273.08** (26.18)	33.43** (4.63)
Black	65.88 (37.51)	-77.00* (35.16)	430.11 (245.76)	.481 (.270)	-128.42** (24.20)	-11.34** (4.28)
Hispanic	-70.13 (51.97)	21.03 (48.71)	-190.54 (340.48)	.024 (.375)	-48.34 (33.52)	.95 (5.93)
Male	204.81** (27.38)	127.66** (25.66)	491.86** (179.34)	1.468** (.197)	132.13** (17.66)	22.67** (3.12)
Female Head Employed	-2.09 (29.11)	-52.56 (27.28)	-454.89* (190.69)	-.402 (.210)	-23.57 (18.77)	-4.04 (3.32)
Female Head Completed High School	-70.13* (34.39)	-59.23 (32.23)	-417.07 (225.31)	-.683** (.248)	-11.83 (22.18)	-3.71 (3.92)
Female Head Completed College	-.21 (45.12)	7.96 (42.29)	174.32 (295.60)	.027 (.325)	38.17 (29.10)	14.20** (5.14)
North Central	5.19 (49.68)	52.69 (46.56)	203.58 (325.45)	.225 (.358)	6.57 (32.04)	1.43 (5.66)
South	23.21 (47.08)	56.01 (44.12)	23.68 (308.41)	.373 (.339)	-39.00 (30.36)	.49 (5.37)
West	-37.87 (55.18)	66.49 (51.71)	307.62 (361.47)	.115 (.398)	14.11 (35.59)	12.25 (6.29)
Family Size	-18.72* (8.78)	-28.06** (8.23)	-50.05 (57.52)	-.109 (.063)	-7.27 (5.66)	-1.66 (1.00)
Monthly Household Income (in 100's)	.27 (1.12)	.19 (1.05)	21.31** (7.33)	.001 (.008)	.31 (.72)	.25* (.13)
Urban	-61.66 (33.25)	7.30 (31.16)	-195.67 (217.81)	-.166 (.240)	2.92 (21.44)	.92 (3.79)
Suburban	-69.47 (39.38)	24.57 (36.91)	-457.83 (257.99)	-.238 (.284)	-22.26 (25.40)	5.57 (4.49)
On Diet	6.56 (57.20)	-44.43 (53.61)	620.96 (374.72)	.151 (.412)	4.02 (36.89)	1.55 (6.52)
Ate Breakfast	345.19** (55.95)	391.07** (52.44)	1,766.78** (366.53)	2.317** (.403)	255.73** (36.09)	51.81** (6.38)
Ate Lunch	369.82** (116.82)	141.99 (109.49)	1,406.97 (765.32)	1.068 (.842)	306.54** (75.35)	51.53** (13.32)
Ate Dinner	316.12** (78.77)	75.31 (73.83)	1,580.19** (516.03)	1.793** (.568)	141.64** (50.81)	16.12 (8.98)
R^2	.063	.050	.030	.050	.121	.101
Mean of Dependent Variable	1,928 kcal	941 µg	4,369 IU	10.87 mg	965 mg	176 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

(Table 6) indicates an attenuation of the SBP effects at breakfast over the 24-hour period. The higher intakes of food energy, calcium, and magnesium at breakfast for SBP participants relative to nonparticipants are not maintained over 24 hours. In addition, although SBP participation has no significant relationship with the intake of vitamin A at breakfast, it has a negative and significant relationship with the total daily intake of vitamin A. Further, the estimated negative coefficient of SBP participation in the equation for the daily intake of iron is almost double the estimated coefficient in the equation for iron intake at breakfast (-1.112 versus -.578).

One possible interpretation of these findings is that participants in the SBP who are 5 to 10 years of age substitute the food consumed at a school breakfast not only for food that would be consumed from an alternative breakfast but also for food that would be consumed at other meals during the day. However, it is possible that these results can be attributed to the fact that SBP participants are systematically different from nonparticipants in ways such that their daily diets are of lower quality. For example, in contrast to the general population, SBP participants are from low-income households and attend schools that are located disproportionately in poor, southern, and urban areas.[1]

---

[1] Of course, the specified models of nutrient intake at breakfast and over 24 hours attempt to control for such differences between SBP participants and nonparticipants. However, as discussed in the methodology section in Chapter II, our ability to control for differences between SBP participants and nonparticipants is limited both by the student and household characteristics that were measured in the NESNP-1 surveys and by a fundamental inability to measure some differences between SBP participants and nonparticipants.

Additional interesting results presented in Table 9 are the coefficients of the variables for the consumption of breakfast, lunch, and dinner. Eating any breakfast has a significant, positive relationship with the daily intake of all the dietary components examined. In contrast, the estimated coefficients of lunch consumption and dinner consumption, although consistently positive, are not always significant. In particular, the daily intake of vitamin B_6 is statistically related only to the consumption of breakfast.

With respect to the effects of the other school nutrition programs, the results in Table 9 show that NSLP participation by 5 to 10 year olds is associated with a higher intake of calcium but a lower intake of magnesium over 24 hours. Since most participants in the SBP also participate in the NSLP,[1] these results suggest that breakfast participants generally have a higher daily intake of calcium and a lower daily intake of magnesium than they would in the absence of the SBP and the NSLP. However, these results can be attributed to the meal content of the NSLP and not to the meal content of the SBP, since the estimated coefficients of SBP participation are not statistically different from zero, as discussed above.

Participants in the SMP have significantly higher total daily intakes of food energy, vitamin B_6, calcium, and magnesium than do nonparticipants; they do not have significantly lower intake levels of any of the dietary components when compared to SMP nonparticipants. However, these findings of significant nutritional benefits of the SMP are of limited relevance due to major changes in the SMP since the NESNP-1 data collection. Specifically, the Omnibus Reconciliation Act of 1981 (OBRA) reduced participation in the SMP by 90 percent, so that as of 1985, the SMP

---

[1] According to the NESNP-1 Final Report, 86 percent of SBP participants are also NSLP participants (Wellisch et al., 1983a).

is a very small program serving only 8,000 of the over 90,000 schools. The SMP is no longer generally available in schools that offer the SBP or the NSLP.

As an analysis of the nutritional adequacy of diets, Table 10 presents the results of the analysis of meeting the RDA for students 5 to 10 years of age. Participation in the SBP is associated with a significantly lower probability of meeting the RDA for vitamin A and a higher probability of meeting the RDA for calcium. A comparison of the results presented in Table 10 with those from the 24-hour analysis of nutrient intake presented in Table 9 shows two interesting findings. First, while SBP participation has a strong negative relationship with the daily intake of iron, there is no significant relationship between SBP participation and the probability of meeting the RDA for iron. Second, SBP participation has a significant positive relationship with the probability of meeting the RDA for calcium, but has no significant association with the daily intake of calcium.[1]

A striking feature of the results presented in Table 10 is the low mean values for the proportion of students achieving the RDA, particularly for food energy, vitamin B_6, and magnesium. Two comments on this are warranted. First, it is important to recognize that the RDA are set such that they will meet the dietary requirements of nearly all healthy people and intakes below the RDA do not necessarily imply dietary deficiencies. Second, food energy and the five nutrients examined in this study were

---

[1] The interpretation of these findings is not obvious. Further work is needed to examine the distributions of the intake of calcium and iron for SBP participants and nonparticipants. For example, the finding with respect to iron may be due to the fact that most respondents do not attain the RDA for iron, so that participation in the SBP is associated with lower intakes of iron but these lower intakes do not lead to changes in the probability of meeting the RDA for iron (since the respondents would not meet the RDA in the absence of the SBP anyway).

Table of Contents

TABLE 10

PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES:
STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,503)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	-1.539**	-.571*	-1.396**	-1.462**	-1.829**	-1.983**
	(.351)	(.336)	(.304)	(.303)	(.308)	(.378)
SBP Participation	**-.036**	**-.156**	**-.244****	**-.156**	**.173***	**-.095**
	(.090)	**(.104)**	**(.085)**	**(.085)**	**(.087)**	**(.107)**
NSLP Participation	-.111	-.129*	.140*	-.069	.375**	-.229**
	(.064)	(.070)	(.062)	(.062)	(.064)	(.069)
SMP Participation	.295**	-.043	.223**	.145*	.894**	.368**
	(.078)	(.090)	(.076)	(.076)	(.089)	(.083)
Black	-.058	-.290**	-.072	.136*	-.286**	-.172*
	(.075)	(.086)	(.071)	(.071)	(.071)	(.087)
Hispanic	.060	.008	-.051	-.014	-.111	.101
	(.102)	(.110)	(.098)	(.097)	(.100)	(.111)
Male	.298**	.032	.197**	.327**	.288**	.326**
	(.054)	(.059)	(.051)	(.051)	(.053)	(.060)
Female Head Employed	-.152**	-.099	-.099*	-.084	-.142**	-.043
	(.057)	(.063)	(.054)	(.054)	(.057)	(.064)
Female Head Completed High School	-.143*	.002	-.118*	-.095	-.004	-.044
	(.067)	(.076)	(.064)	(.064)	(.066)	(.077)
Female Head Completed College	-.075	.112	.221**	.038	.082	.190*
	(.090)	(.094)	(.084)	(.084)	(.089)	(.093)
North Central	.053	.215*	.011	.036	.082	-.125
	(.098)	(.111)	(.093)	(.093)	(.097)	(.107)
South	.044	.213*	-.099	.040	-.115	-.079
	(.093)	(.107)	(.089)	(.089)	(.091)	(.101)
West	-.093	.329**	.007	.028	.077	.163
	(.110)	(.121)	(.104)	(.104)	(.108)	(.116)
Family Size	-.008	-.037*	-.015	-.029*	-.024	-.026
	(.017)	(.019)	(.016)	(.016)	(.017)	(.020)
Monthly Household Income (in 100's)	.002	-.002	.002	-.002	.003	.002
	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)
Urban	-.124	.061	-.146**	-.019	-.036	.008
	(.066)	(.071)	(.062)	(.062)	(.064)	(.073)
Suburban	-.048	.020	-.238**	.068	-.094	.063
	(.077)	(.084)	(.074)	(.074)	(.077)	(.085)
On Diet	-.273*	-.107	.165	-.121	-.170	-.150
	(.119)	(.126)	(.108)	(.107)	(.108)	(.131)
Ate Breakfast	.428**	.674**	.731**	.576**	.842**	.633**
	(.120)	(.161)	(.113)	(.107)	(.110)	(.157)
Ate Lunch	.396	-.446*	.316	.560**	.665**	.480*
	(.245)	(.228)	(.221)	(.220)	(.222)	(.273)
Ate Dinner	.347*	-.349*	.461**	.499**	.379**	.130
	(.166)	(.163)	(.154)	(.151)	(.153)	(.183)
-2*Log LF	107.573	77.406	132.460	107.238	300.867	136.820
Mean of Dependent Variable	.290	.176	.474	.505	.602	.172

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

chosen precisely because they are nutrients at low levels in U.S. diets and, hence, low mean values of the percent achieving the RDA are expected.[1]

The coefficients on the meal consumption variables in Table 10 reinforce the findings from the 24-hour nutrient intake regressions. That is, the consumption of any breakfast is consistently a significant positive predictor of whether students 5 to 10 years of age satisfy the RDA, while lunch and dinner consumption are not consistently significant predictors of whether the RDA are satisfied. In particular, eating breakfast is the critical determinant of whether the RDA for vitamin B_6 is satisfied, since both lunch and dinner consumption are negatively associated with the attainment of the RDA for vitamin B_6. At first glance, this result seems counterintuitive since it is expected that eating any foods at lunch or dinner would, at worst, lead to no change in the intake of a nutrient and, hence, no change in the likelihood of meeting the RDA. However, the RDA for vitamin B_6 increases with protein intake, and lunch and dinner traditionally provide large amounts of protein. These negative relationships between the consumption of lunch and dinner and the probability of meeting the RDA for vitamin B_6 suggest that these meals provide less than the RDA for vitamin B_6 given the protein content of these meals.[2]

2. Eleven to 14 Year Olds

Table 11 provides the results of estimating 24-hour nutrient intake regressions for students ages 11 to 14 years. For this age group, total

---

[1] Evidence on nutrient intake of individuals in the U.S. from the Nationwide Food Consumption Survey also shows these nutrients to be problems nutrients in that average daily intake is less than the RDA for most of these nutrients (USDA, HNIS, May 1984).

[2] The RDA for vitamin B_6 is .02 mg of vitamin B_6 per gram of protein.

TABLE 11

EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 2,018)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	1,061.32** (166.29)	352.11* (139.55)	-413.15 (1,093.82)	3.740** (1.163)	360.14** (112.27)	66.70** (19.06)
SBP Participation	**-141.78* (71.47)**	**-141.91* (59.97)**	**-24.58 (470.09)**	**-.618 (.500)**	**19.67 (48.25)**	**-10.32 (8.19)**
NSLP Participation	-61.00 (45.33)	53.31 (38.04)	763.51** (298.19)	-.365 (.317)	173.56** (30.61)	6.22 (5.20)
SMP Participation	114.03 (71.20)	175.61** (59.75)	404.80 (468.36)	.511 (.498)	239.70** (48.07)	29.75** (8.16)
Black	33.37 (51.14)	-152.10** (42.91)	748.11* (336.37)	-.216 (.358)	-208.44** (34.52)	-28.55** (5.86)
Hispanic	-243.30** (73.51)	-95.11 (61.69)	-8.34 (483.54)	-.773 (.514)	-198.67** (49.63)	-26.07** (8.42)
Male	473.47** (37.68)	275.17** (31.62)	1,158.31** (247.85)	3.433** (.264)	226.52** (25.44)	44.03** (4.32)
Female Head Employed	-5.65 (39.61)	29.11 (33.24)	-72.73 (260.57)	-.095 (.277)	21.07 (26.74)	1.52 (4.54)
Female Head Completed High School	7.17 (45.75)	34.97 (38.39)	-52.19 (300.96)	.090 (.320)	70.28* (30.89)	12.79* (5.24)
Female Head Completed College	18.07 (61.72)	110.36* (51.80)	825.34* (406.01)	.250 (.432)	52.58 (41.67)	9.01 (7.07)
North Central	-103.96 (67.37)	-54.36 (56.53)	-298.71 (443.12)	-.982* (.471)	-38.56 (45.48)	-10.27 (7.72)
South	-65.17 (63.77)	-26.53 (53.51)	-385.75 (419.45)	-.494 (.446)	-52.74 (43.05)	-.82 (7.31)
West	-75.35 (75.02)	-89.61 (62.96)	656.07 (493.47)	-.172 (.525)	30.39 (50.65)	12.21 (8.60)
Family Size	-16.40 (11.01)	-.34 (9.24)	-38.06 (72.44)	-.063 (.077)	-5.31 (7.44)	-1.31 (1.26)
Monthly Household Income (in 100's)	-1.62 (1.43)	1.34 (1.20)	20.33* (9.43)	.007 (.010)	-.11 (.97)	-.11 (.16)
Urban	-11.10 (44.44)	7.08 (37.29)	-791.03** (292.29)	-.057 (.311)	11.14 (30.00)	2.44 (5.09)
Suburban	-159.69** (54.21)	-21.93 (456.49)	-724.04* (356.57)	-.522 (.379)	-19.11 (36.60)	4.93 (6.21)
On Diet	-289.67** (72.37)	-143.07* (60.73)	556.70 (476.05)	-1.602** (.506)	-66.52 (48.86)	-14.22 (8.29)
Ate Breakfast	431.58** (59.27)	369.10** (49.73)	1,801.91** (389.84)	3.122** (.414)	317.09** (40.01)	56.68** (6.79)
Ate Lunch	500.69** (96.82)	87.67 (81.25)	1,073.62 (636.86)	2.792** (.677)	133.01* (65.37)	25.11* (11.10)
Ate Dinner	335.24** (91.18)	62.51 (76.52)	1,409.55* (599.77)	2.564** (.638)	100.41 (61.56)	30.70** (10.45)
R^2	.156	.106	.047	.149	.154	.148
Mean of Dependent Variable	2,187 kcal	978 µg	4,496 IU	12.06 mg	1,050 mg	191 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

daily intakes of food energy and vitamin B_6 are significantly lower for SBP participants than for nonparticipants. These significant differences are not observed when only breakfast intake levels are assessed (Table 7). In addition, the higher levels of calcium intake at breakfast do not persist in the total day assessments. As for the 5 to 10 age group, these findings indicate an attenuation of the SBP effects on food energy, vitamin B_6, and calcium over 24 hours for students 11 to 14 years of age. On the other hand, the significant negative relationships between SBP participation and vitamin A and iron intakes at breakfast become insignificant over 24 hours, indicating that the daily diets of SBP participants tend to compensate for the lower vitamin A and iron content of school breakfasts relative to alternative breakfasts.

As with the findings for students 5 to 10 years of age, the results for students 11 to 14 years of age show the importance of eating breakfast for the daily intake of all the nutrients examined and, in particular, of vitamin B_6. Although the consumption of all three meals is associated with increased intake of almost all the dietary components examined, breakfast is the only meal having a significant positive relationship with the daily intake of vitamin B_6.

The results of the analysis of the probability of meeting the RDA for students 11 to 14 years of age are presented in Table 12. The only significant relationship between participation in the SBP and the likelihood of meeting the RDA is a negative one for vitamin B_6. This finding is consistent with the significant negative relationship between SBP participation on the daily intake of vitamin B_6, as shown in Table 11. However, the estimated negative relationship between participation in the SBP and the daily intake of food energy observed in Table 11 does not appear to change the likelihood of meeting the RDA for food energy, as

TABLE 12

PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES:
STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 2,018)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	-1.524**	-1.295**	-2.069**	-2.204**	-2.260**	-2.149**
	(.294)	(.330)	(.307)	(.359)	(.314)	(.435)
SBP Participation	**-.039**	**-.470****	**-.174**	**-.125**	**.090**	**.042**
	(.111)	**(.173)**	**(.114)**	**(.137)**	**(.115)**	**(.167)**
NSLP Participation	-.099	-.142*	.119*	-.099	.222**	-.015
	(.071)	(.082)	(.072)	(.084)	(.075)	(.094)
SMP Participation	.224*	.078	.249*	.058	.542**	.129
	(.109)	(.126)	(.110)	(.130)	(.111)	(.138)
Black	-.018	-.373**	.017	-.060	-.486**	-.489**
	(.082)	(.107)	(.082)	(.103)	(.090)	(.130)
Hispanic	-.206	-.085	-.302**	.041	-.358**	-.467**
	(.122)	(.149)	(.125)	(.144)	(.127)	(.188)
Male	.157**	.057	.096	.657	.487**	.180*
	(.059)	(.071)	(.060)	(.076)	(.062)	(.082)
Female Head Employed	.060	.052	-.072	.023	-.009	-.057
	(.063)	(.077)	(.063)	(.076)	(.064)	(.087)
Female Head Completed High School	-.034	.017	.073	-.044	.230**	.104
	(.072)	(.091)	(.073)	(.088)	(.076)	(.102)
Female Head Completed College	.147	.255**	.169*	.057	.032	.152
	(.095)	(.105)	(.096)	(.113)	(.095)	(.123)
North Central	-.204	.046	-.030	-.247*	-.046	-.147
	(.105)	(.122)	(.106)	(.132)	(.108)	(.146)
South	-.153	.053	-.015	-.072	-.082	.002
	(.100)	(.116)	(.101)	(.119)	(.104)	(.137)
West	-.127	-.164	.208*	-.100	.086	.236
	(.118)	(.140)	(.118)	(.141)	(.121)	(.153)
Family Size	-.025	.013	-.008	-.016	-.032*	-.044
	(.018)	(.022)	(.018)	(.022)	(.019)	(.027)
Monthly Household Income (in 100's)	-.006*	.002	.003	.004	.001	-.003
	(.002)	(.003)	(.002)	(.003)	(.002)	(.003)
Urban	-.037	-.044	-.124*	-.057	.021	.138
	(.071)	(.086)	(.071)	(.086)	(.073)	(.096)
Suburban	-.237**	.015	-.120	-.086	-.067	.078
	(.086)	(.100)	(.086)	(.105)	(.088)	(.117)
On Diet	-.392**	-.109	-.193	-.608**	-.218*	-.221
	(.126)	(.144)	(.120)	(.198)	(.124)	(.182)
Ate Breakfast	.644**	.821**	.486**	.486**	.817**	.561**
	(.107)	(.162)	(.105)	(.146)	(.122)	(.183)
Ate Lunch	.610**	-.249	.425**	.354	.625**	.450*
	(.179)	(.170)	(.179)	(.221)	(.195)	(.271)
Ate Dinner	.366*	-.317*	.681**	.237	.197	-.004
	(.159)	(.160)	(.181)	(.206)	(.165)	(.215)
-2*Log LF	122.610	98.417	106.552	133.954	281.894	73.906
Mean of Dependent Variable	.326	.127	.311	.120	.302	.073

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

shown by the small and insignificant coefficient of SBP participation in Table 12.

Once again, the coefficients of the meal consumption variables underscore the importance of eating breakfast. For all the dietary components examined, the probability of meeting the RDA is significantly higher for breakfast eaters than for breakfast skippers. Further, the consumption of breakfast is generally the most important meal consumption variable predicting whether the RDA are satisfied, particularly with respect to vitamin B_6.

3. Fifteen to 21 Year Olds

Nutrient intake regression results for students ages 15 years and older are provided in Table 13. Participation in the SBP is associated with significant increases in total daily calcium intake. Thus, the observed positive and significant relationship between SBP participation and calcium intake at breakfast (Table 8) is maintained throughout the day. It should again be stressed that the number of SBP participants in this age group is so small that the insignificance of the SBP participation variable in the remaining nutrient intake equations, both at breakfast and over 24 hours, is not surprising.

Again, the estimated effects of the meal consumption variables provide further support for the findings discussed for the two younger age groups. That is, in general, the consumption of all three meals is associated with higher daily intakes of the dietary components examined, although breakfast does not consistently dominate the effects of lunch and dinner, as it does for the two younger age groups.

The estimated equations for whether the RDA are achieved for students 15 to 21 years of age are presented in Table 14. Participation in the SBP has a significant negative relationship with the probability of

TABLE 13

EQUATIONS FOR NUTRIENT INTAKE OVER 24 HOURS: STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,639)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	1,018.01** (169.17)	304.36* (135.58)	2,053.09* (868.68)	4.150** (1.147)	311.30** (120.92)	65.51** (19.58)
SBP Participation	**21.08 (125.69)**	**-118.30 (100.74)**	**496.20 (645.43)**	**-.991 (.852)**	**206.83* (89.85)**	**7.11 (14.55)**
NSLP Participation	102.82 (54.55)	126.21** (43.72)	480.17 (280.10)	.616 (.370)	194.61** (38.99)	12.60* (6.31)
SMP Participation	297.80* (125.48)	233.69* (100.57)	844.88 (644.32)	.665 (.851)	399.92** (89.69)	46.56** (14.52)
Black	-211.47** (66.81)	-119.76* (53.55)	315.85 (343.07)	-.623 (.453)	-259.38** (47.76)	-42.03** (7.73)
Hispanic	-385.13** (95.01)	-122.14 (76.14)	-348.69 (487.86)	-1.263* (.644)	-197.84** (67.91)	-20.32 (11.00)
Male	1,106.62** (48.94)	525.37** (39.22)	2,145.84** (251.30)	6.538** (.332)	587.64** (34.98)	102.32** (5.66)
Female Head Employed	28.81 (51.25)	33.10 (41.07)	-103.77 (263.16)	-.107 (.347)	-12.97 (36.63)	-1.50 (5.93)
Female Head Completed High School	8.31 (57.65)	-28.53 (46.20)	-288.95 (296.02)	-.093 (.391)	9.35 (41.21)	4.89 (6.67)
Female Head Completed College	5.96 (82.17)	142.55* (65.86)	563.11 (421.97)	.344 (.557)	83.30 (58.74)	18.11 (9.51)
North Central	-154.61 (86.11)	-43.08 (69.02)	-872.90* (442.19)	-1.540** (.584)	-32.82 (61.56)	-21.95* (9.97)
South	-83.75 (77.63)	-172.73** (62.22)	-985.40* (398.65)	-.731 (.526)	-249.74** (55.49)	-37.91** (8.98)
West	-109.61 (98.62)	15.23 (79.04)	-373.80 (506.41)	-1.467* (.669)	-22.47 (70.49)	-10.16 (11.41)
Family Size	34.92* (13.76)	-27.44* (11.03)	-217.51** (70.67)	-.206* (.093)	-21.51* (9.84)	-2.16 (1.59)
Monthly Household Income (in 100's)	2.67 (1.71)	4.48** (1.37)	26.86** (8.77)	.030** (.012)	3.75** (1.22)	.46* (.20)
Urban	53.46 (58.19)	10.80 (46.64)	-332.47 (298.81)	.083 (.395)	19.59 (41.60)	2.01 (6.73)
Suburban	-44.77 (69.22)	-12.09 (55.48)	-473.44 (355.46)	.050 (.469)	-21.02 (49.48)	-2.92 (8.01)
On Diet	-285.44** (77.59)	-75.92 (62.18)	40.83 (398.40)	-1.335* (.526)	-13.37 (55.46)	-15.92 (8.93)
Ate Breakfast	284.76** (60.73)	324.23** (48.67)	1,176.98** (311.83)	2.292** (.412)	234.56** (43.41)	44.00** (7.03)
Ate Lunch	528.51** (82.62)	62.88 (66.22)	273.744 (424.25)	2.066** (.560)	245.39** (59.06)	38.73** (9.56)
Ate Dinner	380.56** (97.51)	217.24** (78.15)	1,520.80** (500.70)	3.491** (.661)	232.39** (69.70)	48.69** (11.28)
R^2	.349	.198	.091	.285	.295	.295
Mean of Dependent Variable	2,388 kcal	969 µg	4,347 IU	12.84 mg	1,097 mg	202 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 14

PROBIT EQUATIONS FOR MEETING THE RECOMMENDED DIETARY ALLOWANCES:
STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,639)

	Dependent Variables					
	Food Energy	Vitamin B_6	Vitamin A	Iron	Calcium	Magnesium
Constant	-1.575** (.248)	-1.317** (.297)	-1.484** (.252)	-2.604** (.333)	-1.849** (.265)	-2.433** (.430)
SBP Participation	**-.107 (.176)**	**-.622* (.319)**	**-.118 (.180)**	**-.006 (.203)**	**.394* (.176)**	**.308 (.240)**
NSLP Participation	.161* (.074)	-.002 (.093)	.062 (.076)	.046 (.089)	.268** (.081)	.034 (.103)
SMP Participation	.463* (.175)	-.138 (.230)	.134 (.172)	.042 (.203)	.473** (.173)	.250 (.202)
Black	-.128 (.095)	-.164 (.124)	-.123 (.095)	-.225* (.120)	-.465** (.107)	-.671** (.169)
Hispanic	-.330* (.135)	.080 (.169)	-.352** (.144)	-.316* (.163)	-.198 (.147)	-.437* (.206)
Male	.682** (.067)	.116 (.086)	.447** (.069)	1.149** (.089)	.997** (.073)	.575** (.099)
Female Head Employed	-.042 (.071)	.043 (.092)	-.085 (.072)	.008 (.085)	.018 (.075)	.034 (.097)
Female Head Completed High School	.063 (.081)	.288** (.110)	.081 (.081)	-.107 (.097)	.067 (.086)	-.114 (.114)
Female Head Completed College	-.064 (.110)	.190 (.130)	.340** (.111)	.068 (.124)	.297** (.112)	.224* (.135)
North Central	-.319** (.120)	.048 (.144)	-.325** (.118)	-.059 (.143)	-.019 (.124)	-.122 (.150)
South	-.156 (.108)	-.038 (.131)	-.282** (.107)	-.008 (.132)	-.433** (.111)	-.337** (.138)
West	-.220 (.136)	-.045 (.164)	-.177 (.137)	-.222 (.171)	-.040 (.142)	-.166 (.178)
Family Size	-.023 (.019)	-.031 (.025)	-.035 (.020)	-.036 (.024)	-.034 (.022)	-.046 (.032)
Monthly Household Income (in 100's)	.002 (.002)	.004 (.003)	-.002 (.002)	.006** (.002)	.001 (.002)	.001 (.003)
Urban	-.079 (.081)	-.090 (.103)	-.130 (.081)	-.040 (.096)	-.008 (.085)	.051 (.107)
Suburban	-.043 (.095)	.157 (.115)	-.167* (.098)	.109 (.113)	-.194* (.101)	.029 (.128)
On Diet	-.451** (.116)	.109 (.129)	.037 (.109)	-.166 (.148)	-.068 (.118)	-.041 (.148)
Ate Breakfast	.428** (.080)	.517** (.125)	.452** (.092)	.451** (.115)	.546** (.099)	.417** (.143)
Ate Lunch	.624** (.133)	0.475** (.130)	.226* (.122)	.465** (.162)	.428** (.140)	.205 (.181)
Ate Dinner	.406** (.144)	-.032 (.171)	.721** (.167)	.438* (.213)	.350* (.163)	.751** (.302)
-2*Long LF	284.731	74.886	171.239	293.932	423.602	132.284
Mean of Dependent Variable	.399	.101	.305	.140	.300	.071

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

satisfying the RDA for vitamin B_6 and a significant positive relationship with the probability of satisfying the RDA for calcium. The result for calcium reinforces the evidence of strong nutritional benefits of the SBP for this age group with respect to calcium intake. The significant negative relationship between SBP participation and the likelihood of meeting the RDA for vitamin B_6 is somewhat surprising, given the insignificant relationships estimated for both the intake of vitamin B_6 at breakfast (Table 8) and the daily intake of vitamin B_6 (Table 13). However, as discussed in the context of the findings for students 5 to 10 years of age, it is possible for a variable to have no significant influence on the intake of vitamin B_6 yet to have a significant negative relationship with the probability of meeting the RDA for vitamin B_6. This is because the RDA for vitamin B_6 increases with protein intake, so higher levels of protein intake that are not matched accordingly with vitamin B_6 intake lead to lower probabilities of meeting the RDA for vitamin B_6.

IV. IMPACTS OF THE SCHOOL BREAKFAST PROGRAM ON MACRONUTRIENT AND CHOLESTEROL INTAKE

This section is primarily devoted to the presentation of findings from a multivariate analysis of the impacts of the SBP on the proportion of food energy derived from protein, fat, and carbohydrate both at breakfast and over 24 hours. Also discussed in this section are findings from a multivariate analysis of the impact of the SBP on the breakfast and 24-hour intakes of cholesterol.

A. SUMMARY OF FINDINGS

The findings from the two analyses that are reported in this section can be summarized briefly. Participation in the SBP is found to have no statistically significant relationship with the proportion of breakfast or 24-hour food energy obtained from either protein, fat, or carbohydrate. However, students 5 to 10 years of age and 11 to 14 years of age who eat a school breakfast are found to consume significantly less cholesterol both at breakfast and over 24 hours than otherwise similar students who eat an alternative breakfast. The cholesterol intake of students 15 to 21 years of age is not related to SBP participation.

B. MACRONUTRIENT INTAKE

The human body derives food energy from the three macronutrients--protein, fat, and carbohydrate--and from alcohol. Data from the 1977-78 Nationwide Food Consumption Survey show that the average proportion of food energy obtained by school-age children from protein is 15-16 percent; fat, 38-40 percent; and carbohydrate, 44-48 percent (USDA/SEA, 1980, Table 3.4). Alcohol provides less than 0.3 percent of food energy for this age group and, consequently, is not considered in this report.

Food proteins provide amino acids that are essential for the synthesis of body proteins and other tissue constituents. School-age children obtain protein primarily from three major food groups: meat, poultry, and fish; milk and milk products; and grain products. The National Research Council (NRC) specifies an allowance for protein in terms of grams of daily protein intake per kilogram of body weight, rather than the percent contribution of protein to total food energy (NRC, p. 46).

Dietary fat provides the body with essential fatty acids and is also a carrier of fat-soluble vitamins. The three previously mentioned food groups, as well as fats and oils, and vegetables are the principal sources of fat in the diets of school-age children. The NRC has not formally established an allowance for dietary fat; however, as a guideline, it suggests that the intake of fat should be limited to no more than 35 percent of total food energy (NRC, p. 36).

Carbohydrate in the diet is contributed largely by sugars (primarily from milk and milk products, fruits, soft drinks, and sweets), and by starches (primarily from grain products and vegetables). The NRC has established no specific dietary allowance for carbohydrate (NRC, p. 33): however, it recommends that a "reasonable proportion" of food energy should be derived from carbohydrate to avoid excessive breakdown of body proteins, loss of sodium, and dehydration.

1. Macronutrient Intake at Breakfast

The breakfast macronutrient analysis is based upon the model depicted in equations (1) - (2) and utilizes the same explanatory variables as the previously discussed breakfast micronutrient analysis. An important distinction between the two analyses is that the dependent variables in the macronutrient analysis are measures of the relative contribution (expressed

as a percentage) of each macronutrient to the total breakfast intake of food energy, whereas the dependent variables in the micronutrient analysis are measures of the absolute intake of each micronutrient. The percentage of food energy attributable to each macronutrient was computed using energy conversion factors of 4 kcal/gm of food protein and carbohydrate and 9 kcal/gm of food fat (Merrill and Watt, 1955).

The regression equations for the percent of breakfast food energy derived from protein, fat, and carbohydrate are presented in Tables 15-17. For all three macronutrients and for all three age groups of students no statistically significant differences between SBP participants and nonparticipants who eat an alternative breakfast are observed for the percentage of breakfast food energy obtained from each of the three macronutrients.

Although SBP participation has no significant relationship with breakfast sources of food energy, this is not the case for certain other characteristics of students and their households. Among students 5 to 10 years of age the proportion of breakfast food energy derived from fat is 3.4 perentage points higher and the proportion derived from carbohydrate is 3.9 percentage points lower if the female head of household is employed. Female education also has a significant relationship with the breakfast sources of food energy of the youngest group of students but not of the two older groups. Specifically, students ages 5 to 10 years who are from households in which the female head completed high school obtain significantly less breakfast energy from fat and significantly more from carbohydrate than otherwise similar students from households in which the female head did not complete high school.

In addition, Tables 15-17 show some significant differences in sources of breakfast food energy by race, ethnicity, and geographic

TABLE 15

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,337)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	12.42** (1.30)	34.95** (4.40)	52.63** (5.16)
SBP Participation	**.21** **(.33)**	**.71** **(.97)**	**-.91** **(1.16)**
Black	.50 (.45)	5.66** (1.54)	-6.16** (1.80)
Hispanic	.21 (.40)	2.82 (1.45)	-3.03 (1.68)
Male	.37 (.22)	-.41 (.83)	.05 (.96)
Female Head is Employed	.45 (.36)	3.44** (1.28)	-3.88** (1.49)
Female Head Completed High School	-.64 (.48)	-3.50* (1.66)	4.13* (1.95)
Female Head Completed College	-.25 (.60)	-3.50 (2.14)	3.76 (2.49)
North Central	.32 (.37)	-.74 (1.10)	.42 (1.31)
South	.36 (.35)	.46 (1.06)	-.82 (1.26)
West	.83* (.41)	.76 (1.24)	-1.59 (1.47)
Family Size	.11 (.08)	-.21 (.31)	.09 (.36)
Monthly Household Income (in 100's)	-.01 (.01)	-.03 (.03)	.05 (.04)
Urban	.41 (.24)	.45 (.74)	-.86 (.87)
Suburban	.65* (.29)	-1.34 (.87)	.68 (1.03)
On Diet	-.09 (.55)	-.58 (2.01)	.67 (2.33)
Sample Selection Correction Factor	-3.60 (5.38)	-30.88 (17.86)	34.49 (20.98)
Mean of Dependent Variable	13.00%	29.69%	57.31%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 16

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 1,784)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	10.27**	24.02**	65.71**
	(1.68)	(5.20)	(6.16)
SBP Participation	**-.10**	**.27**	**-.16**
	(.45)	**(1.38)**	**(1.64)**
Black	.45	5.23*	-5.68*
	(.79)	(2.45)	(2.90)
Hispanic	.84	3.19	-4.03
	(.68)	(2.10)	(2.48)
Male	.80	.79	-1.59
	(.55)	(1.70)	(2.01)
Female Head is Employed	-.22	-.60	.82
	(.27)	(.84)	(.99)
Female Head Completed High School	-.13	-1.12	1.24
	(.39)	(1.20)	(1.42)
Female Head Completed College	.24	.10	-.34
	(.75)	(2.33)	(2.76)
North Central	.74	1.07	-1.80
	(.44)	(1.35)	(1.60)
South	1.25**	5.63**	-6.88**
	(.41)	(1.28)	(1.52)
West	1.50**	2.02	-3.52*
	(.49)	(1.51)	(1.79)
Family Size	.13	.33	-.46
	(.08)	(.25)	(.30)
Monthly Household Income (in 100's)	-.01	-.03	.04
	(.01)	(.03)	(.03)
Urban	.02	-1.03	1.01
	(.29)	(.91)	(1.07)
Suburban	1.15**	.97	-2.11
	(.35)	(1.08)	(1.28)
On Diet	1.34	-.03	-1.32
	(.70)	(2.17)	(2.57)
Sample Selection Correction Factor	1.65	5.08	-6.73
	(6.64)	(20.58)	(24.35)
Mean of Dependent Variable	12.83%	30.33%	56.85%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 17

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,304)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	11.86**	31.27**	56.88**
	(1.71)	(4.74)	(5.80)
SBP Participation	.68	1.96	-2.64
	(.80)	(2.22)	(2.70)
Black	1.52	4.06	-5.58*
	(.81)	(2.26)	(2.76)
Hispanic	1.99*	7.96**	-9.95**
	(.92)	(2.55)	(3.12)
Male	.25	1.51	-1.76
	(.68)	(1.88)	(2.30)
Female Head is Employed	-.15	.37	-.21
	(.40)	(1.12)	(1.37)
Female Head Completed High School	.72	-.22	-.51
	(.43)	(1.20)	(1.47)
Female Head Completed College	-.80	-4.15	4.95
	(.86)	(2.39)	(2.93)
North Central	.77	-.39	-.38
	(.61)	(1.70)	(2.07)
South	.69	3.20*	-3.89*
	(.55)	(1.54)	(1.88)
West	1.55*	.31	-1.86
	(.70)	(1.97)	(2.40)
Family Size	.03	-.05	.02
	(.10)	(.28)	(.34)
Monthly Household Income (in 100's)	-.01	-.02	.02
	(.01)	(.04)	(.05)
Urban	-.43	-2.73*	3.17*
	(.41)	(1.15)	(1.40)
Suburban	-.50	-3.81**	4.32**
	(.49)	(1.36)	(1.66)
On Diet	1.29	.78	-2.07
	(.73)	(2.02)	(2.48)
Sample Selection Correction Factor	-2.89	-5.78	8.66
	(4.45)	(12.36)	(15.13)
Mean of Dependent Variable	12.49%	30.95%	56.56%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

region. Black students obtain a larger percentage of breakfast food energy from fat and a smaller percentage from carbohydrate than white students. Among the oldest students, Hispanics obtain larger percentages of breakfast energy from protein and fat and a smaller percentage from carbohydrate than do non-Hispanics. Protein is a significantly more important source of breakfast food energy for students of all ages who reside in the West. Among students ages 11 to 14 years and 15 to 21 years, those who reside in the South obtain proportionally more of their breakfast food energy from fat and proportionally less from carbohydrate than otherwise similar students.

2. Macronutrient Intake Over 24 Hours

The model of the 24-hour intake of food energy and micronutrients that was described in Chapter III is adapted in a straightforward manner for use in analyzing the relationship between SBP participation and the percent of food energy over 24 hours that is derived from protein, fat, and carbohydrate. Recall that three features of the 24-hour model distinguish it from the model of nutrient intake at breakfast:

1. Inclusion of breakfast skippers in the analysis
2. Expansion of the list of explanatory variables to include three binary indicators of breakfast, lunch, and dinner consumption
3. Expansion of the list of explanatory variables to include two binary indicators of participation in the NSLP and SMP

Results of the analysis of the sources of food energy over 24 hours are presented in Tables 18-20. For all three age groups these tables show that there is no significant relationship between SBP participation and the percentage of 24-hour food energy obtained from any of the three macro-

Table of Contents

TABLE 18

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,503)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	12.39** (.90)	36.98** (1.66)	50.63** (2.04)
SBP Participation	**.08 (.25)**	**-.04 (.47)**	**-.03 (.58)**
NSLP Participation	1.46** (.18)	.09 (.34)	-1.55** (.42)
SMP Participation	.39 (.23)	1.16** (.42)	-1.55** (.51)
Black	.25 (.21)	.30 (.39)	-.55 (.48)
Hispanic	.62* (.29)	-1.74** (.54)	1.11 (.66)
Male	.35* (.15)	.58* (.28)	-.92** (.35)
Female Head is Employed	-.02 (.16)	.57 (.30)	-.55 (.37)
Female Head Completed High School	-.10 (.19)	-.06 (.36)	.16 (.44)
Female Head Completed College	-.02 (.25)	-.14 (.47)	.16 (.57)
North Central	-.25 (.28)	-.91 (.51)	1.17 (.63)
South	-.39 (.26)	-.55 (.49)	.94 (.60)
West	-.50 (.31)	.03 (.57)	.47 (.70)
Family Size	.04 (.05)	-.05 (.09)	.01 (.11)
Monthly Household Income (in 100's)	.01 (.01)	-.00 (.01)	-.00 (.01)
Urban	.35 (.19	-.44 (.34)	.09 (.42)
Suburban	.84** (.22)	-.15 (.41)	-.68 (.50)
On Diet	.60 (.32)	.02 (.59)	-.62 (.73)
Ate Breakfast	-.18 (.31)	-1.44* (.58)	1.62* (.71)
Ate Lunch	-.54 (.65)	-.18 (1.21)	.72 (1.48)
Ate Dinner	1.49** (.44)	.85 (0.81)	-2.34* (1.00)
R^2	.046	.019	.022
Mean of Dependent Variable	14.77%	35.98%	49.25%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 19

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 2,018)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	12.54** (.78)	35.50** (1.41)	51.96** (1.70)
SBP Participation	**.18 (.34)**	**-.84 (0.61)**	**.66 (.73)**
NSLP Participation	1.12** (.21)	.74 (.39)	-1.86** (.46)
SMP Participation	.42 (.33)	.67 (.61)	-1.09 (.73)
Black	-.10 (.24)	.77 (.43)	-.67 (.52)
Hispanic	.32 (.34)	-2.71** (.62)	2.39** (.75)
Male	.50** (.18)	.06 (.32)	-.56 (.39)
Female Head is Employed	-.27 (.19)	.42 (.34)	-.15 (.41)
Female Head Completed High School	.62** (.21)	-.60 (.39)	-.02 (.47)
Female Head Completed College	-.08 (.29)	-.89 (.52)	.97 (.63)
North Central	-.25 (.32)	-1.12 (.57)	1.37 (.69)
South	-.05 (.30)	-.70 (.54)	.75 (.65)
West	.23 (.35)	-.30 (.64)	.06 (.77)
Family Size	-.09 (.05)	.03 (.09)	.05 (.11)
Monthly Household Income (in 100's)	-.01 (.01)	-.02 (.01)	.02 (.01)
Urban	.45* (.21)	.23 (.38)	-0.68 (.45)
Suburban	.76** (.25)	-.32 (.46)	-.44 (.56)
On Diet	.91** (.34)	-.61 (.62)	-.30 (.74)
Ate Breakfast	-.12 (.28)	-1.24* (.50)	1.36* (.61)
Ate Lunch	-.49 (.45)	1.80* (.82)	-1.31 (.99)
Ate Dinner	1.72** (.43)	1.07 (.78)	-2.79** (.93)
R^2	.042	.034	.035
Mean of Dependent Variable	14.73%	36.54%	48.73%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE 20

EQUATIONS FOR PERCENT OF FOOD ENERGY DERIVED FROM PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,639)

	Dependent Variables		
	Protein	Fat	Carbohydrate
Constant	12.92** (.75)	35.27** (1.41)	51.81** (1.71)
SBP Participation	**.45 (.55)**	**-.66 (1.05)**	**.20 (1.27)**
NSLP Participation	.94** (.24)	-.31 (.46)	-.63 (.55)
SMP Participation	1.00 (.55)	.11 (1.05)	-1.11 (1.27)
Black	.73* (.29)	.66 (.56)	-1.39* (.67)
Hispanic	1.46** (.42)	-1.86* (.79)	.40 (.96)
Male	.83** (.22)	.94* (.41)	-1.77** (.49)
Female Head is Employed	-.20 (.23)	.45 (.43)	-.25 (.52)
Female Head Completed High School	-.01 (.25)	.34 (.48)	-.34 (.58)
Female Head Completed College	-.26 (.36)	-.33 (.69)	.59 (.83)
North Central	-.41 (.38)	-1.16 (.72)	1.57 (.87)
South	-.76* (.34)	-.86 (.65)	1.62* (.78)
West	.02 (.43)	-.94 (.82)	.92 (1.00)
Family Size	-.06 (.06)	-.09 (.11)	.15 (.14)
Monthly Household Income (in 100's)	.02** (.01)	-.00 (.01)	-.02 (.02)
Urban	.35 (.26)	.19 (.49)	-.54 (.59)
Suburban	-.42 (.30)	-.94 (.58)	1.36 (.70)
On Diet	1.21** (.34)	1.24 (.65)	-2.45 (.78)
Ate Breakfast	-.12 (.27)	-.17 (.51)	.28 (.61)
Ate Lunch	-1.06** (.36)	1.01 (.69)	.05 (.83)
Ate Dinner	2.06** (.43)	1.32 (.81)	-3.38** (.98)
R^2	.022	.062	.035
Mean of Dependent Variable	14.74%	36.68%	48.58%

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

nutrients. Given the previous finding of no relationship between SBP participation and breakfast sources of food energy, the finding of no 24-hour SBP relationship is not surprising.

Although SBP participation has no significant relationship with the relative importance of the three macronutrients as sources of food energy over 24 hours, this is not the case with regard to whether or not any breakfast was eaten. Tables 18 and 19 show that breakfast eaters 5 to 10 years of age and 11 to 14 years of age obtain significantly smaller proportions of food energy over 24 hours from fat and significantly larger proportions from carbohydrate than do breakfast skippers.

The other school nutrition programs, the NSLP and the SMP, are estimated to have some significant relationships with the relative importance of each of the three macronutrients as sources of 24-hour food energy. For NSLP participants in all three age groups, protein is a significantly more important source of 24-hour food energy than it is for NSLP nonparticipants. Also, among all but the oldest students, NSLP participants obtain significantly smaller proportions of 24-hour energy from carbohydrate. Significant effects of SMP participation are restricted to the youngest group of students, for whom it results in greater reliance on fat and less reliance on carbohydrate as sources of food energy over 24 hours.

This analysis also reveals strong sex-based differences in sources of food energy. Male students are estimated to obtain larger proportions of 24-hour food energy from protein and fat and a smaller proportion from carbohydrate. All of these differences are statistically significant for the youngest and oldest groups of students, but only the protein difference is significant for the middle age group.

C. CHOLESTEROL INTAKE

Populations like that of the United States., with diets high in cholesterol, tend to have high serum cholesterol levels and a greater incidence of heart attacks (USDA and DHSS, 1985). Although a causal relationship between the consumption of cholesterol-rich foods and the risk of a heart attack has not been conclusively established, it has been established that high serum cholesterol is one of the major risk factors for heart attacks. However, there is no conclusive evidence that the intake of foods high in cholesterol results in high levels of serum cholesterol.

The same statistical model used to obtain estimates of the effects of SBP participation on breakfast intakes of food energy and micronutrients and on the percentage contribution of each macronutrient to the breakfast intake of food energy is also used to obtain estimates of the relationship between SBP participation and the breakfast intake of cholesterol. Regression estimates of the cholesterol intake model for the three age groups of students are presented in Table 21. For students 5 to 10 and 11 to 14 years of age, SBP participation is associated with large and significant negative reductions in the breakfast intake of cholesterol.

Table 22 presents regression estimates of a model of cholesterol intake over 24 hours that is a straightforward adaption of the previously discussed model of 24-hour nutrient intakes. Eating a breakfast is associated with significantly higher levels of cholesterol intake over 24 hours by students in all three age groups. However, the cholesterol intake of students in the two youngest age groups who eat a school breakfast is is significantly smaller than that of students who eat an alternative breakfast.

Given the growing scientific evidence of a relationship between consumption of foods high in cholesterol and increased risk of heart

Table of Contents

TABLE 21

EQUATIONS FOR INTAKE OF CHOLESTEROL IN MILLIGRAMS AT BREAKFAST
(Standard errors in parentheses)

	Students' Ages		
	5-10 Years (N=2,337)	11-14 Years (N=1,234)	15-21 Years (N=1,304)
Constant	57.30 (36.23)	-40.58 (59.30)	63.76 (57.07)
SBP Participation	**-38.45**** **(9.29)**	**-66.62**** **(13.33)**	**-43.24** **(26.98)**
Black	29.56* (12.60)	-20.28 (25.83)	44.63 (27.22)
Hispanic	47.54** (10.84)	38.25 (24.09)	45.28 (30.71)
Male	12.55* (6.04)	54.26* (20.75)	74.35** (22.59)
Female Head is Employed	-4.81 (9.92)	-16.80 (13.04)	-26.53* (13.38)
Female Head Completed High School	-2.16 (13.33)	-26.68 (16.36)	-11.99 (14.41)
Female Head Completed College	(7.16 (16.66)	45.96 (29.86)	-51.88 (28.71)
North Central	8.81 (10.31)	-3.96 (13.22)	-24.17 (20.61)
South	17.88 (9.79)	23.69 (12.71)	31.37 (18.72)
West	16.41 (11.46)	7.40 (14.92)	38.68 (23.97)
Family Size	.95 (2.32)	7.56* (3.68)	-.26 (3.35)
Monthly Household Income (in 100's)	-.19 (.24)	-.33 (.46)	1.34** (.49)
Urban	-.05 (6.83)	-16.08 (9.08)	-8.10 (13.96)
Suburban	.61 (8.11)	12.54 (10.37)	-5.20 (16.55)
On Diet	12.41 (14.90)	-23.56 (28.63)	25.61 (24.33)
Sample Selection Correction Factor	17.35 (149.72)	430.71 (224.63)	-12.06 (149.05)
Mean of Dependent Variable	84 mg	92 mg	120 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

TABLE 22

EQUATIONS FOR INTAKE OF CHOLESTEROL IN MILLIGRAMS OVER 24 HOURS
(Standard errors in parentheses)

	Students' Ages		
	5-10 Years (N=2,503)	11-14 Years (N=2,018)	15-21 Years (N=1,639)
Constant	77.21 (43.24)	32.31 (40.15)	56.43 (44.60)
SBP Participation	**-43.90*** **(12.27)**	**-69.75**** **(17.30)**	**8.01** **(33.14)**
NSLP Participation	1.75 (8.89)	-5.41 (10.95)	-2.14 (14.38)
SMP Participation	31.21** (10.91)	7.30 (17.19)	97.25** (33.08)
Black	38.54** (10.08)	17.12 (12.35)	15.23 (17.61)
Hispanic	44.54** (13.97)	42.64* (17.75)	28.90 (25.05)
Male	35.44** (7.36)	73.66** (9.10)	179.57** (12.90)
Female Head is Employed	-.75 (7.82)	-4.18 (9.56)	-20.10 (13.51)
Female Head Completed High School	-15.41 (9.24)	.61 (11.05)	-13.82 (15.20)
Female Head Completed College	-4.18 (12.12)	-11.37 (14.90)	40.27 (21.66)
North Central	-8.73 (13.35)	-35.81* (16.27)	-53.37* (22.70)
South	2.25 (12.65)	5.07 (15.40)	-2.97 (20.47)
West	-3.98 (14.83)	-5.91 (18.11)	-6.22 (26.00)
Family Size	-.58 (2.36)	3.25 (2.66)	-5.14 (3.63)
Monthly Household Income (in 100's)	-.02 (.30)	-.36 (.35)	1.51** (.45)
Urban	-4.94 (8.93)	-2.24 (10.73)	-9.64 (15.34)
Suburban	4.79 (10.58)	8.07 (13.09)	-22.45 (18.25)
On Diet	19.08 (15.37)	8.98 (17.47)	4.10 (20.45)
Ate Breakfast	88.54** (15.03)	96.65** (14.31)	104.70** (16.01)
Ate Lunch	33.85 (31.39)	64.94** (23.38)	43.79* (21.78)
Ate Dinner	35.40 (21.17)	53.56* (22.01)	74.59** (25.71)
R^2	.039	.077	.172
Mean of Dependent Variable	243 mg	269 mg	305 mg

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

attack, the finding that SBP participants have lower cholesterol intake both at breakfast and over 24 hours than do students who eat alternative breakfasts is especially important. This finding is also noteworthy because NESNP-1 did not examine cholesterol intake and, hence, this is the first empirical evidence that school breakfasts are low in cholesterol.

V. FOOD ITEMS EATEN AT BREAKFAST

To simplify somewhat and to review briefly the results of the nutrient intake analyses discussed above, participation in the SBP is associated with a lower intake of iron and, occasionally vitamins B_6 and A, and a higher intake of calcium.[1] In addition, the intake of cholesterol is lower for SBP participants than for nonparticipants. These results are based on models relating nutrient intake to participation in the SBP and other school nutrition programs and to a set of socioeconomic factors. The objective of this section is to analyze the food choices that account for the differences in nutrient intake between SBP participants and nonparticipants. Descriptive tables are presented to show the percentage of students by age and SBP participation status eating breakfast food items and the average quantities consumed, and statistical tests of significance are conducted to determine if the food choices of SBP participants differ statistically from those of nonparticipants. In addition, because the dietary habits vary significantly for males and females, particularly with respect to quantities consumed, the descriptive data on food choices and statistical tests of significance are presented separately for males and females.

Descriptive data showing the common breakfast foods consumed and the average quantity (in grams) consumed are presented in Table 23 for

---

[1]This is an oversimplification of the empirical analyses discussed above because the effects of SBP participation vary substantially by age and whether the analysis is of nutrient intake at breakfast or over 24 hours.

TABLE 23

FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE
(Weighted Data)

	Percent of Students Eating Food Item				Mean Grams of Food Item Consumed[a]			
	Male		Female		Male		Female	
	SBP Participant	Non USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast
Milk	84	72**	74	68	260.17	200.45**	219.56	171.34**
Chocolate Milk	13	2**	19	3**	227.60	286.53**	226.45	227.85
Eggs	10	16*	13	16	61.82	74.41**	50.67	66.15**
Meats	3	3	1	2	74.89	37.54**	40.55	45.77**
Sausage	8	4	11	4*	34.07	50.97**	35.07	57.89**
Citrus Juices	44	26**	44	29**	155.82	211.04**	122.25	184.15**
Citrus Fruits	6	2	5	2	100.62	98.88	92.10	99.43
Other Fruit	18	5**	27	4**	112.23	95.40	82.27	86.67
Butter & Margarine	20	30*	15	29**	4.81	8.14**	5.51	6.91**
Bacon	10	6	3	6	12.25	16.79**	8.31	16.71**
Dry/Prepared Cereals	42	47	33	44*	25.26	38.23**	21.28	30.75**
Cooked Cereals	15	10	13	9	132.15	173.45**	77.25	160.39**
Breads & Toast	30	28	30	29	25.47	37.42**	30.80	32.72
Pancakes, Muffins, Coffee Cake, etc.	35	18**	40	17**	49.80	61.80**	37.08	60.58**
Cake or Cookies	5	3	5	4	25.39	44.61**	19.96	53.34**
Sugars, Syrups	34	42	33	41	10.22	20.00**	13.27	11.53
Peanut Butter	6	2	6	1	21.34	23.23	15.35	22.37**

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

[a] Mean grams consumed by those students consuming the food item.

*(**): Different from the percent or mean quantity consumed of SBP participants in the same age and sex category at the .05(.01) level of significance, two-tailed test.

students aged 5 to 10 years.[1] These results indicate that, relative to male nonparticipants who eat breakfast, male SBP participants are significantly more likely to consume milk, chocolate milk, citrus juices, other fruit, and pancakes or the like at breakfast. On the other hand, male SBP nonparticipants who eat breakfast are more likely than male SBP participants to have breakfasts containing eggs and butter and margarine. The results for females are similar, except that the difference between female participant and nonparticipant breakfast eaters in the percent consuming milk is not statistically different from zero and female SBP participants are significantly more likely to eat sausage and less likely to eat dry/prepared cereals than students who eat an alternative breakfast.

A striking finding shown in Table 23 is the higher average quantities consumed of most food groups by nonparticipants relative to SBP participants. Interestingly, even for the food groups eaten by proportionately more SBP participants than nonparticipants, the average quantity consumed by individuals consuming these foods is usually significantly greater for SBP nonparticipants than for SBP participants. An important exception is milk, where the average quantity consumed is significantly greater for SBP participants of both sexes than for nonparticipants who eat breakfast. On the other hand, it is important to note that these differences in quantities consumed do not lead to a lower

---

[1] The choice of food items was based on a listing of all breakfast and pre-breakfast foods consumed. Similar foods (e.g., Cheerios and Corn Flakes) were aggregated into food groups (e.g., dry/prepared cereals). The foods examined include almost all breakfast foods consumed, with the exclusions being those foods that are consumed very infrequently by students at breakfast (sweetened ades, soda, additions to milk, cheese, and vegetable juices, and coffee or tea). Although not exactly the same, the food items examined in this study are similar to those analyzed in an Interim Report from the second National Evaluation of School Nutrition Programs (Hanes, 1984).

intake of food energy at breakfast for SBP participants than for non-participants. Indeed, for 5 to 10 year olds, SBP participation is positively associated with the intake of food energy at breakfast (Table 6). Apparently, the smaller quantities consumed by SBP participants relative to nonparticipants are being compensated for by either a greater variety of foods consumed or by the higher quantities of milk consumed.

Although it is difficult in an analysis of this sort to link directly the nutrient intake findings and the analysis of food choices, the results provided in Table 23 are generally consistent with the estimated effects of SBP participation on nutrient intake at breakfast (Table 6).[1] The significantly higher intakes of calcium and magnesium for SBP participants 5 to 10 years of age relative to SBP nonparticipants who eat breakfast are apparently due to both the larger percentage of SBP participants consuming milk and chocolate milk at breakfast and the higher average quantity consumed of milk. The lower intake of iron for SBP participants relative to nonparticipant breakfast eaters is consistent with a lower percentage consuming and a smaller average quantity consumed of dry/prepared cereals. Finally, the lower intake of cholesterol for SBP participants than for nonparticipants is consistent with a lower percentage of SBP participants consuming eggs and the lower average quantity of eggs consumed.

The food choices of students 11 to 14 years of age are summarized in Table 24. These results are quite similar to those for the 5 to 10 year

---

[1]The results of the analysis of food items eaten at breakfast are interpreted in the context of the analysis of nutrient intake at breakfast, as opposed to daily nutrient intake, since to link the 24-hour nutrient analyses to food choices would require an examination of the foods eaten over 24 hours, not simply at breakfast.

TABLE 24

FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE
(Weighted Data)

	Percent of Students Eating Food Item				Mean Grams of Food Item Consumed[a]			
	Male		Female		Male		Female	
	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast
Milk	75	73	70	63	246.51	258.03	167.54	195.84
Chocolate Milk	19	1**	25	1**	260.11	303.71**	204.25	254.82**
Eggs	4	17**	6	16**	53.70	80.93**	40.49	73.03**
Meats	7	4	0	2	54.11	44.48	28.40	41.59
Sausage	17	4**	22	4**	42.76	70.77**	28.07	45.02**
Citrus Juices	40	26*	35	30	165.21	252.90**	145.06	236.88**
Citrus Fruits	3	2	3	2	71.54	125.16**	117.11	98.44**
Other Fruit	18	3**	13	5	76.90	88.91	61.86	85.61**
Butter & Margarine	9	27**	8	29**	7.28	9.33**	8.22	7.16
Bacon	5	8	6	7	6.66	22.76**	10.94	17.77**
Dry/Prepared Cereals	32	41	28	37	38.75	48.39*	20.66	34.00**
Cooked Cereals	3	8	3	9	51.63	208.69**	75.74	165.33**
Breads & Toast	23	28	20	28	35.75	42.06**	33.48	34.73
Pancakes, Muffins, Coffee Cake, etc.	52	21**	46	17**	47.99	88.71**	40.14	53.22**
Cake or Cookies	2	6	8	3	15.38	50.79**	19.47	47.22**
Sugars, Syrups	38	39	26	33	20.74	18.28	18.96	13.52
Peanut Butter	4	1	1	2	47.33	28.98**	15.00	35.65**

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

[a] Mean grams consumed by those students consuming the food item.

*(**): Different from the percent or mean quantity consumed of SBP participants in the same age and sex category at the .05(.01) level of significance, two-tailed test.

olds. SBP participants are more likely than nonparticipants who eat breakfast to consume chocolate milk, sausage, citrus juices (males only), other fruit (males only), and pancakes or related foods and are less likely than nonparticipants to consume eggs and butter and margarine. As with students 5 to 10 years of age, the average quantity consumed of breakfast foods is usually significantly higher for SBP nonparticipants who eat breakfast than for SBP participants, even for those foods that are consumed more frequently by participants. These differences in quantities consumed, however, do not translate into significant differences in the intake of food energy at breakfast (Table 7).

As before, these food choices are generally consistent with the estimated effects of the SBP on nutrient intake at breakfast (Table 7). In particular, the higher intake of calcium for SBP participants 11 to 14 years of age is apparently the result of a higher percentage of participants than of nonparticipants consuming chocolate milk at breakfast, and the lower intakes of vitamin A and iron for SBP participants is consistent with a smaller average quantity consumed of dry/prepared cereals. In addition, the lower intake of cholesterol for SBP participants relative to nonparticipants is likely the result of the lower percentage of SBP participants consuming eggs and the lower average quantity consumed.

Finally, Table 25 presents data on the food choices of students 15 to 21 years of age. Although these results generally parallel those for the two younger age groups, two differences in the food choices of the older teenagers are apparent. First, the percentage of male SBP participants consuming white milk is significantly less than the percentage of male SBP nonparticipants consuming white milk, although this is more than offset by the very high percentage of male SBP participants consuming

TABLE 25

FOOD ITEMS EATEN AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE
(Weighted Data)

	Percent of Students Eating Food Item				Mean Grams of Food Item Consumed[a]			
	Male		Female		Male		Female	
	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast	SBP Participant	Non-USDA Breakfast
Milk	36	62*	79	57*	329.19	299.49	235.73	170.53**
Chocolate Milk	54	2**	9	0	463.31	418.62	216.52	125.00**
Eggs	9	19	3	15*	88.56	100.83	83.98	72.85**
Meats	3	3	1	2	38.62	78.03**	130.20	52.54
Sausage	6	4	14	3	39.92	111.41**	57.54	38.87**
Citrus Juices	26	23	57	27*	160.68	286.05**	139.21	210.89**
Citrus Fruits	2	3	1	3	106.74	107.21	65.50	109.83
Other Fruit	2	7	1	3	52.84	107.07**	201.70	102.08
Butter & Margarine	55	28*	15	26	13.21	13.26	3.38	8.79**
Bacon	6	12	14	5	11.90	24.76**	11.18	16.53**
Dry/Prepared Cereals	12	29*	3	23*	27.48	58.87**	28.21	35.07**
Cooked Cereals	13	8	7	8	79.26	268.43**	76.49	140.57**
Breads & Toast	24	31	27	28	31.24	52.91**	26.39	34.68**
Pancakes, Muffins, Coffee Cake, etc.	69	22**	82	15**	78.38	121.54**	63.76	49.94
Cake or Cookies	5	5	2	7	5.88	114.54**	14.10	67.69**
Sugars, Syrups	68	43*	18	31	29.50	21.47*	33.24	18.91**
Peanut Butter	4	3	3	2	38.71	26.88**	20.56	17.45

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

[a] Mean grams consumed by those students consuming the food item.

*(**): Different from the percent or mean quantity consumed of SBP participants in the same age and sex category at the .05(.01) level of significance, two-tailed test.

chocolate milk relative to male SBP nonparticipants. Second, SBP participants of both sexes are significantly less likely to consume dry/prepared cereals than nonparticipants who eat breakfast.

A comparison of Tables 23-25 show two food consumption patterns that differ by age. First, for both SBP participants and nonparticipants who eat breakfast, the percentage consuming dry/prepared cereals decreases with age. Given that these cereals are usually fortified and are important sources of such nutrients as iron, vitamin A, vitamin B_6, and magnesium, this finding suggests that the breakfast contribution of these micronutrients decreases as children age. Second, the percentage of SBP participants consuming pancakes, muffins, and coffee cake increases substantially with age, while the comparable percentage of SBP nonparticipant breakfast eaters is largely unchanged across the three age groups.

In summary, the analysis of food choices reported in Tables 23-25 has two important implications for the effects of the SBP. First, the breakfast foods consumed by SBP participants differ significantly from the foods consumed by SBP nonparticipants who eat breakfast. In particular, SBP participants are, in general, more likely than SBP nonparticipant breakfast eaters to consume milk products (particularly chocolate milk), citrus juices, other fruit, and pancakes or the like and are less likely to consume dry/prepared cereals and eggs. Second, except for milk products and a few less commonly reported breakfast foods, SBP participants generally consume a lower average quantity of the food items consumed relative to SBP nonparticipants who eat breakfast. This is true for both the foods consumed by proportionately more SBP participants and the foods consumed by proportionately more SBP nonparticipant breakfast eaters.

These differences in the types of foods and quantities consumed are, for the most part, consistent with the estimated association of SBP participation with increased intake of calcium and decreased intakes of vitamin A, iron, and cholesterol. However, no negative relationships between SBP participation and the breakfast intake of food energy are estimated, despite the results showing the average quantities consumed of most breakfast foods to be smaller for SBP participants than for nonparticipants.

VI. SUMMARY AND CONCLUSIONS

This study provides evidence on the dietary impacts of the SBP through a systematic investigation of the decision to eat any breakfast, an analysis of the food items eaten at breakfast, and an examination of food energy, micronutrient, macronutrient, and cholesterol intake at breakfast and over 24 hours. The study is essentially a re-analysis of the 24-hour dietary recall and student data collected during the 1980-81 school year as part of the first National Evaluation of School Nutrition Programs.

The analysis of the decision to eat breakfast, where breakfast includes all foods eaten at or before school, shows that the availability of the SBP has no significant relationship with the likelihood of eating breakfast. This finding is based on both descriptive and multivariate analyses of the decision to eat breakfast and is observed for both the entire analysis sample and a low-income subsample. In addition, breakfast skipping is found to increase with age; only 5-6 percent of students 5 to 10 years of age skipped breakfast, while 17 percent of males and 25 percent of females 15 to 21 years of age skipped breakfast.

The analysis of the breakfast food items eaten at or before school provides some interesting insights into the breakfast eating habits of SBP participants and nonparticipants. A number of common breakfast food items are consumed more frequently by SBP participants than by nonparticipants. SBP participants are generally more likely than nonparticipant breakfast eaters to consume milk products, citrus juices, other fruit, and pancakes or the like at breakfast and are generally less likely to consume eggs, butter and margarine, and dry/prepared cereals. However, except for milk

products and a few less commonly reported breakfast foods, SBP participants have significantly lower average quantities consumed of the breakfast food items than nonparticipants, even for those foods consumed by proportionately more SBP participants.

The nutrient intake analyses presented in this report also provide findings with respect to participation in the SBP that are important in assessing the impacts of the SBP. SBP participation declines with age; approximately 10-11 percent of school-age children 5 to 10 years of age participate in the SBP, 6-7 percent of children 11 to 14 years of age participate, and only 3-4 percent of children 15 to 21 years of age participate. This finding suggests that the emphasis on the effects of the SBP should probably be directed more to the findings for the two younger age groups, since it is this population that would be affected most by any program changes.

Findings from the macronutrient and cholesterol analyses indicate that the SBP has no significant relationship with the proportion of total food energy obtained from protein, fat, or carbohydrate. However, participation in the SBP by students 5 to 10 years of age and 11 to 14 years of age is associated with lower intakes of cholesterol both at breakfast and over 24 hours relative to alternative breakfasts. Given the evidence that diets high in cholesterol are associated with a greater incidence of heart disease, these findings indicate a major nutritional benefit of the SBP with respect to cholesterol intake.

Although difficult to generalize, findings from the analysis of food energy and micronutrient intake show some positive and negative effects of the SBP. First, calcium intake and the likelihood of meeting

the RDA for calcium are generally positively related to participation in the SBP, particularly for older teenagers and for students 5 to 10 years of age. Second, the intake of iron at breakfast for students ages 5 to 10 and 11 to 14 is negatively associated with participation in the SBP, although the probability of meeting the RDA for iron over 24 hours is not related to SBP participation. Third, the probability of meeting the RDA for vitamin B_6 over 24 hours is lower for SBP participants ages 11 to 14 and 15 to 21 than for otherwise similar nonparticipants. Fourth, some positive relationships with SBP participation are detected for magnesium and some negative relationships are estimated for vitamin A, but these relationships are not found consistently for the different age groups. Finally, very few statistically significant relationships are observed for food energy, the exceptions being a positive association between the intake of food energy at breakfast and SBP participation for students 5 to 10 years of age and a negative association between the 24-hour intake of food energy and SBP participation for students 11 to 14 years of age.

An additional finding of the analyses undertaken for this study is that breakfast is the most important meal of the day with respect to daily nutrient intake and the likelihood of meeting the RDA, particularly for vitamin B_6. Eating any breakfast consistently has a significant positive relationship with the daily intake of food energy and all five micronutrients examined. In addition, eating any breakfast is the critical determinant of whether the RDA for vitamin B_6 is achieved.

The findings from the nutrient intake analyses are generally consistent with the findings from the analysis of the food items eaten at breakfast. The nutritional benefits of the SBP with respect to higher

intakes of calcium and lower intakes of cholesterol can be attributed, respectively, to the higher percentage of SBP participants consuming milk and the lower percentage consuming eggs relative to SBP nonparticipants who eat breakfast. The lower intake of iron for SBP participants relative to nonparticipant breakfast eaters is consistent with a lower percentage consuming and a smaller average quantity consumed of dry/prepared cereals. On the other hand, except for milk products, SBP participants generally have lower average quantities consumed of most breakfast foods than do nonparticipants, yet the nutrient intake findings show almost no significant relationships between SBP participation and the intake of food energy. Apparently, the smaller quantities consumed by SBP participants relative to nonparticipants are offset by either a greater variety of foods consumed, by the higher quantities of milk consumed, or by more calorie-dense foods being served in school breakfast relative to alternative breakfasts.

REFERENCES

Hanes, Sally. "Interim Report: Food Items Reported for Breakfast." National Evaluation of School Nutrition Programs, System Development Corporation, October 26, 1984.

Heckman, James J. "Sample Selection Bias as a Specification Error." Econometrica, Vol. 47, 1979, pp. 153-161.

Maddala, G.S. Econometrics. New York: McGraw-Hill Book Company, 1977.

Merrill, A.L. and B.K. Watt. Energy Values of Foods, Basis and Derivation. U.S. Department of Agriculture, Human Nutrition Information Service. Washington, D.C.: USGPO, 1955.

Morgan, Karen J., Mary E. Zabik, and Gilbert A. Leveille. "The Role of Breakfast in Nutrient Intake of 5-to-12-Year-Old Children." The American Journal of Clinical Nutrition, vol. 34, July 1981, pp. 1418-1427.

Morgan, Karen J., Mary E. Zabik, and Gary L. Stampley. "Breakfast Consumption Patterns of U.S. Children and Adolescents." Forthcoming, Nutrition Research.

National Research Council, Committee on Dietary Allowances. Recommended Dietary Allowances, ninth revised edition. Washington, D.C.: National Academy of Sciences, 1980.

U.S. Department of Agriculture, Human Nutrition Information Service. Nutrient Intakes: Individuals in 48 States, Year 1977-78. NFCS 1977-78, Report No. I-2. Washington, D.C.: USDA/HNIS, May 1984.

U.S. Department of Agriculture, Science and Education Administration. Food and Nutrient Intakes of Individuals in 1 Day in the United States, Spring 1977. NFCS 1977-78 Preliminary Report No. 2. Washington, DC: USDA/SEA, 1980.

U.S. Department of Agriculture and U.S. Department of Health and Human Services. Nutrition and Your Health: Dietary Guidelines for Americans. Home and Garden Bulletin no. 232, 2nd edition. Washington, D.C.: USDA-DHHS, 1985.

U.S. Department of Health, Education, and Welfare. National Center for Health Statistics. Caloric and Selected Nutrient Values for Persons 1-74 Years of Age: First Health and Nutrition Examination Survey, United States, 1971-74, Series 11, No. 209, June 1979.

Wellisch, Jean B., Sally D. Hanes, Lawrence A. Jordan, Kenneth M. Mauer, and Joyce A. Vermeersch. The National Evaluation of School Nutrition Programs: Final Report, Volume 1--Overview and Presentation of Findings. Santa Monica, CA: System Development Corporation, 1983a.

Table of Contents

Wellisch, Jean B., Sally D. Hanes, Lawrence A. Jordan, Kenneth M. Mauer, and Joyce A. Vermeersch. The National Evaluation of School Nutrition Programs: Final Report, Volume 2--Technical Appendices. Santa Monica, CA: System Development Corporation, 1983b.

Table of Contents

APPENDIX A

SUPPLEMENTAL TABLES:
FOOD ENERGY AND MICRONUTRIENT INTAKE

Table of Contents

TABLE A.1

DESCRIPTIVE DATA ON NUTRIENT INTAKE AT BREAKFAST: STUDENTS 5 TO 10 YEARS OF AGE

	Male				Female			
	SBP Participant (N=159)		Non-USDA Breakfast (N=931)		SBP Participant (N=162)		Non-USDA Breakfast (N=902)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	423	19	385	17	364	16	319	14
Vitamin B_6 (µg)	368	26	448	32	297	26	354	30
Vitamin A (IU)	1.228	37	1.443	44	890	27	1,149	34
Iron (mg)	2.3	23	3.1	31	1.8	18	2.6	26
Calcium (mg)	357	45	263	33	292	37	213	27
Magnesium (mg)	59	24	50	21	50	21	40	16
Vitamin C (mg)	45	101	41	91	38	83	34	76
Thiamin (mg)	.48	52	.51	51	.37	46	.41	47
Niacin (mg)	3.7	30	4.2	31	2.7	25	3.5	29
Riboflavin (mg)	.70	63	.65	54	.56	59	.53	50
Phosphorus (mg)	354	44	297	37	288	36	237	30

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Means and % RDA are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.2

DESCRIPTIVE DATA ON NUTRIENT INTAKE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE

	Male				Female			
	SBP Participant (N=98)		Non-USDA Breakfast (N=754)		Non-Participant (N=76)		Non-USDA Breakfast (N=733)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	478	19	462	18	350	16	340	16
Vitamin B_6 (µg)	389	23	508	29	221	15	351	29
Vitamin A (IU)	1,236	25	1,609	32	737	18	1,147	29
Iron (mg)	2.6	15	3.9	21	1.6	9	2.6	14
Calcium (mg)	360	30	331	28	272	23	223	19
Magnesium (mg)	60	17	63	18	38	13	43	14
Vitamin C (mg)	42	83	43	86	31	63	43	86
Thiamin (mg)	.54	48	.60	48	.36	37	.41	45
Niacin (mg)	4.3	28	5.1	31	2.4	19	3.6	29
Riboflavin (mg)	.72	53	.79	53	.50	45	.54	50
Phosphorus (mg)	387	32	372	31	275	23	248	21

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE Means and % RDA are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.3

DESCRIPTIVE DATA ON NUTRIENT INTAKE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE

	Male				Female			
	SBP Participant (N=39)		Non-USDA Breakfast (N=612)		SBP Participant (N=28)		Non-USDA Breakfast (N=554)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	681	24	560	20	482	24	293	14
Vitamin B_6 (µg)	279	14	492	21	126	8	239	21
Vitamin A (IU)	1,110	22	1,526	31	740	19	919	23
Iron (mg)	2.9	16	4.0	23	1.8	10	2.1	11
Calcium (mg)	536	45	350	29	348	29	172	14
Magnesium (mg)	70	17	67	17	57	19	36	12
Vitamin C (mg)	24	40	44	73	46	77	33	56
Thiamin (mg)	.73	51	.66	42	.51	40	.31	37
Niacin (mg)	3.3	17	5.2	25	2.2	14	2.7	22
Riboflavin (mg)	.87	51	.80	44	.57	39	.40	40
Phosphorus (mg)	527	44	401	34	347	29	196	16

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Means and % RDA are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.4

DESCRIPTIVE DATA ON NUTRIENT INTAKE OVER 24 HOURS
STUDENTS 5 TO 10 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 159)		Non-USDA Breakfast (N = 931)		No Breakfast (N = 74)		SBP Participant (N = 162)		Non-USDA Breakfast (N = 902)		No Breakfast (N = 80)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	1 938	88	2,058	91	1,747	80	1,780	80	1,812	82	1,501	68
Vitamin B_6 (µg)	962	65	1,087	76	556	45	827	64	891	72	544	54
Vitamin A (IU)	4,707	139	4,876	147	3,113	92	3,501	105	4,275	128	2,552	76
Iron (mg)	10.6	106	11.8	118	9.9	99	9.8	98	10.1	101	7.8	78
Calcium (mg)	1,030	129	1,057	132	748	93	871	109	926	116	615	77
Magnesium (mg)	183	76	195	81	121	49	156	65	168	69	117	48
Vitamin C (mg)	97	215	99	221	52	116	87	193	87	193	52	115
Thiamin (mg)	1.42	150	1.53	152	1.16	136	1.25	146	1.29	144	0.91	125
Niacin (mg)	16.7	131	17.7	131	13.8	118	13.9	114	15.2	125	12.0	118
Riboflavin (mg)	2.10	184	2.17	178	1.50	147	1.71	167	1.85	173	1.20	138
Phosphorus (mg)	1,301	163	1,331	166	1 061	133	1 116	139	1,155	144	845	106

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Means and % RDA are weighted, sample sizes are unweighted.

Table of Contents

TABLE A.5

PERCENTAGE OF INDIVIDUALS OBTAINING 75 AND 100 PERCENT OF THE RDA: STUDENTS 5 TO 10 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 159)		Non-USDA Breakfast (N = 931)		No Breakfast (N = 74)		SBP Participant (N = 162)		Non-USDA Breakfast (N = 902)		No Breakfast (N = 80)	
	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%
Food Energy	65	33	64	34	41	21	48	21	52	24	35	13
Vitamin B_6	29	14	39	24	11	7	31	16	36	20	19	8
Vitamin A	59	44	74	57	39	29	53	33	64	45	32	22
Iron	77	57	81	58	62	39	67	42	70	44	40	22
Calcium	89	70	84	68	57	32	81	51	76	56	50	22
Magnesium	41	16	49	26	13	5	30	10	37	16	11	4
Vitamin C	78	74	72	61	48	33	81	71	71	62	48	36
Thiamin	99	86	97	84	86	69	99	83	96	80	93	68
Niacin	90	69	90	74	86	57	76	58	87	65	80	58
Riboflavin	100	97	99	96	94	86	99	97	99	94	94	86
Phosphorus	97	89	94	84	88	66	93	77	92	79	81	53

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Percents are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.6

DESCRIPTIVE DATA ON NUTRIENT INTAKE OVER 24 HOURS:
STUDENTS 11 TO 14 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 98)		Non-USDA Breakfast (N = 754)		No Breakfast (N = 89)		SBP Participated (N = 76)		Non-USDA Breakfast (N = 733)		No Breakfast (N = 132)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	2,390	97	2,554	97	1,994	73	1,984	88	1,900	87	1,474	63
Vitamin B_6 (µg)	1,003	58	1,235	68	655	43	816	53	886	68	473	45
Vitamin A (IU)	6,042	121	5,285	106	3,016	60	3,721	93	3,972	99	2,075	52
Iron (mg)	13.8	77	14.7	82	10.1	56	10.4	58	10.4	58	7.5	41
Calcium (mg)	1,199	100	1,310	109	784	65	968	81	957	80	612	51
Magnesium (mg)	213	61	236	68	145	41	157	52	171	57	112	37
Vitamin C (mg)	115	229	114	228	63	126	98	197	100	200	44	87
Thiamin (mg)	1.77	152	1.85	148	1.16	126	1.29	135	1.36	147	0.89	118
Niacin (mg)	20.9	134	22.1	133	15.6	1132	15.3	112	15.8	124	11.5	111
Riboflavin (mg)	2.48	179	2.64	175	1.66	143	1.80	158	1.92	171	1.18	139
Phosphorus (mg)	1,577	131	1,673	139	1,053	88	1,272	106	1,211	101	822	69

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Means and % RDA are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.7

PERCENTAGE OF INDIVIDUALS OBTAINING 75 AND 100 PERCENT OF THE RDA: STUDENTS 11 TO 14 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 98)		Non-USDA Breakfast (N = 754)		No Breakfast (N = 89)		SBP Participant (N = 76)		Non-USDA Breakfast (N = 733)		No Breakfast (N = 132)	
	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%	≥75%	≥100%
Food Energy	65	46	73	39	51	15	62	38	57	29	25	9
Vitamin B_6	25	9	34	18	10	7	20	3	35	18	7	1
Vitamin A	45	37	55	37	22	16	36	24	51	32	17	12
Iron	40	21	50	22	16	7	25	3	18	8	8	2
Calcium	73	47	71	52	38	8	41	24	49	26	18	4
Magnesium	26	12	34	13	7	2	13	7	20	7	6	1
Vitamin C	80	75	74	66	46	39	81	77	67	58	35	30
Thiamin	97	93	97	86	84	60	98	80	96	84	90	69
Niacin	92	77	92	73	82	52	88	64	85	67	70	55
Riboflavin	100	98	99	93	96	83	99	94	97	91	96	81
Phosphorus	90	71	91	75	61	28	81	49	69	47	34	17

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Percents are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.8

DESCRIPTIVE DATA ON NUTRIENT INTAKE OVER 24 HOURS:
STUDENTS 15 TO 21 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 39)		Non-USDA Breakfast (N = 612)		No Breakfast (N = 120)		SBP Participant (N = 28)		Non-USDA Breakfast (N = 554)		No Breakfast (N = 197)	
	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA	Mean	% RDA
Food Energy (kcal)	2,882	104	3,131	114	2,798	101	2,433	122	1,806	84	1,610	75
Vitamin B_6 (µg)	791	39	1,376	59	928	52	744	42	759	62	495	43
Vitamin A (IU)	4,227	85	6,314	126	5,151	103	3,836	96	3,386	85	2,950	74
Iron (mg)	14.0	78	17.2	97	14.0	78	11.3	63	9.4	52	8.1	45
Calcium (mg)	1,285	108	1,556	131	1,275	107	1,206	101	808	68	657	55
Magnesium (mg)	197	49	276	69	211	53	203	68	155	52	124	41
Vitamin C (mg)	75	125	137	229	106	176	120	201	96	160	57	95
Thiamin (mg)	1.88	131	2.20	142	1.58	117	2.15	173	1.18	133	0.94	121
Niacin (mg)	20.1	105	26.6	129	22.8	126	15.4	99	14.7	117	12.8	112
Riboflavin (mg)	2.29	132	3.14	169	2.45	142	2.39	161	1.62	154	1.26	135
Phosphorus (mg)	1,667	140	1,993	168	1,701	143	1,524	128	1,054	88	901	75

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Means and % RDA are weighted; sample sizes are unweighted.

Table of Contents

TABLE A.9

PERCENTAGE OF INDIVIDUALS OBTAINING 75 AND 100 PERCENT OF THE RDA: STUDENTS 15 TO 21 YEARS OF AGE

Dietary Components	Male						Female					
	SBP Participant (N = 39)		Non-USDA Breakfast (N = 612)		No Breakfast (N = 120)		SBP Participant (N = 28)		Non-USDA Breakfast (N = 554)		No Breakfast (N = 197)	
	≥ 75%	≥100%	≥ 75%	≥100%	≥ 75%	≥100%	≥ 75%	≥100%	≥ 75%	≥100%	≥ 75%	≥100
Food Energy	86	73	80	59	67	41	71	64	60	32	43	20
Vitamin B_6	6	4	27	13	16	12	0	0	30	13	9	3
Vitamin A	35	19	62	46	36	26	33	28	44	27	28	20
Iron	26	17	62	36	46	25	15	10	16	5	10	3
Calcium	80	30	76	60	48	34	75	33	35	19	21	9
Magnesium	10	6	35	18	18	10	14	13	17	5	9	3
Vitamin C	81	33	69	61	56	49	83	68	66	58	35	29
Thiamin	93	85	94	79	85	55	91	79	88	74	83	61
Niacin	96	37	92	69	89	72	86	17	80	57	80	60
Riboflavin	93	92	98	92	93	82	97	86	95	80	88	74
Phosphorus	96	86	92	82	74	60	86	74	60	32	43	24

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of of School Nutrition Programs, Fall 1980.

NOTE: Percents are weighted; sample sizes are unweighted.

Table of Contents

APPENDIX B

SUPPLEMENTAL TABLES:
MACRONUTRIENT AND CHOLESTEROL INTAKE

Table of Contents

TABLE B.1

MEAN INTAKE OF PROTEIN, FAT,
CARBOHYDRATE, AND CHOLESTEROL AT BREAKFAST

Dietary Item/ SBP Participation Status	Ages 5-10		Ages 11-14		Ages 15-21	
	Male	Female	Male	Female	Male	Female
Protein (gm)						
SBP Participant	15.1	12.2	16.4	11.3	20.7	15.4
Non-USDA Breakfast	12.3	10.1	15.4	10.9	18.2	8.9
Fat (gm)						
SBP Participant	15.4	14.0	17.8	13.4	27.4	19.1
Non-USDA Breakfast	12.7	10.9	16.4	11.8	22.5	10.3
Carbohydrate (gm)						
SBP Participant	57.5	48.4	64.0	47.3	90.1	63.1
Non-USDA Breakfast	56.4	46.0	64.4	48.3	72.8	41.9
Cholesterol (mg)						
SBP Participant	67.4	70.0	55.9	44.5	116.2	52.7
Non-USDA Breakfast	88.1	73.5	96.7	77.1	142.1	70.5
Sample Sizes						
Unweighted:						
SBP Participant	159	162	98	76	39	28
Non-USDA Breakfast	931	902	754	733	612	554
Weighted:						
SBP Participant	.67m	.70m	.41m	.35m	.22m	.19m
Non-USDA Breakfast	5.68m	5.62m	5.03m	4.69m	4.40m	4.08m

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Weighted data were used.

Table of Contents

TABLE 8.2

MEAN INTAKE OF PROTEIN, FAT,
CARBOHYDRATE, AND CHOLESTEROL OVER 24 HOURS

Dietary Item/ SBP Participation Status	Ages 5-10		Ages 11-14		Ages 15-21	
	Male	Female	Male	Female	Male	Female
Protein (gm)						
SBP Participant	76	65	89	73	100	87
Non-USDA Breakfast	76	66	95	70	117	64
No Breakfast	66	51	71	52	104	58
Fat (gm)						
SBP Participant	78	71	98	83	107	120
Non-USDA Breakfast	84	72	105	78	133	75
No Breakfast	74	60	88	64	117	68
Carbohydrate (gm)						
SBP Participant	237	224	296	242	387	257
Non-USDA Breakfast	156	226	313	235	372	223
No Breakfast	208	183	236	176	331	195
Cholesterol (mg)						
SBP Participant	257	214	263	218	349	365
Non-USDA Breakfast	262	223	309	236	423	215
No Breakfast	177	143	263	129	279	151
Sample Sizes						
Unweighted:						
SBP Participant	159	162	98	76	39	28
Non-USDA Breakfast	931	902	754	733	612	554
No Breakfast	74	80	89	132	120	197
Weighted:						
SBP Participant	.67m	.70m	.41m	.35m	.22m	.19m
Non-USDA Breakfast	5.68m	5.62m	5.03m	4.69m	4.40m	4.08m
No Breakfast	.33m	.43m	.65m	.85m	.93m	1.39m

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Weighted data were used.

Table of Contents

TABLE B.3

MEAN PERCENT OF BREAKFAST FOOD ENERGY
PROVIDED BY PROTEIN, FAT, AND CARBOHYDRATE

Macronutrient/ SBP Participation Status	Ages 5-10		Ages 11-14		Ages 15-21	
	Male	Female	Male	Female	Male	Female
Percent of Breakfast Energy from Protein						
SBP Participant	14.0	13.2	13.3	12.4	12.0	12.7
Non-USDA Breakfast	12.9	12.5	13.3	12.4	12.3	11.9
Percent of Breakfast Energy from Fat						
SBP Participant	30.5	32.8	31.5	30.5	35.3	35.3
Non-USDA Breakfast	28.4	28.5	29.1	28.5	31.0	28.6
Percent of Breakfast Energy from Carbohydrate						
SBP Participant	55.5	54.0	55.1	57.2	52.8	52.1
Non-USDA Breakfast	58.7	59.0	57.6	59.0	56.6	59.5
Sample Sizes						
Unweighted:						
SBP Participant	159	162	98	76	39	28
Non-USDA Breakfast	931	902	754	733	612	554
Weighted:						
SBP Participant	.67m	.70m	.41m	.35m	.22m	.19m
Non-USDA Breakfast	5.68m	5.62m	5.03m	4.69m	4.40m	4.08m

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Weighted data were used.

Table of Contents

TABLE B.4

MEAN PERCENT OF 24-HOUR FOOD ENERGY
PROVIDED BY PROTEIN, FAT, AND CARBOHYDRATE

Macronutrient/ SBP Participation Status	Ages 5-10		Ages 11-14		Ages 15-21	
	Male	Female	Male	Female	Male	Female
Percent of 24-Hour Energy from Protein						
SBP Participant	15.7	14.8	15.2	15.0	13.8	14.3
Non-USDA Breakfast	14.8	14.7	15.0	14.6	15.1	14.3
No Breakfast	15.4	13.9	14.5	14.4	14.6	15.2
Percent of 24-Hour Energy from Fat						
SBP Participant	35.7	35.3	35.5	36.0	33.2	43.0
Non-USDA Breakfast	35.9	35.5	36.2	35.9	37.4	36.1
No Breakfast	37.7	36.1	38.6	38.6	36.7	36.7
Percent of 24-Hour Energy from Carbohydrate						
SBP Participant	48.6	50.0	49.3	48.9	53.0	42.7
Non-USDA Breakfast	49.4	49.8	48.8	49.5	47.5	49.6
No Breakfast	46.9	50.0	46.9	47.0	48.8	48.1
Sample Sizes						
Unweighted:						
SBP Participant	159	162	98	76	39	28
Non-USDA Breakfast	931	902	754	733	612	554
No Breakfast	74	80	89	132	120	197
Weighted:						
SBP Participant	.67m	.70m	.41m	.35m	.22m	.19m
Non-USDA Breakfast	5.68m	5.62m	5.03m	4.69m	4.40m	4.08m
No Breakfast	.33m	.43m	.65m	.85m	.93m	1.39m

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

NOTE: Weighted data were used.

Table of Contents

TABLE B.5

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST:
STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,337)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	11.47**	15.38**	47.40**
	(2.50)	(3.55)	(8.68)
SBP Participation	1.28*	.93	4.97*
	(.59)	(.80)	(2.21)
Black	2.53**	4.92**	-.63
	(.87)	(1.24)	(3.02)
Hispanic	.10	.82	-2.49
	(.79)	(1.16)	(2.61)
Male	1.84**	1.39*	7.41**
	(.45)	(.66)	(1.46)
Female Head is Employed	.25	1.46	-3.38
	(.71)	(1.03)	(2.39)
Female Head Completed High School	-1.11	-2.17	.13
	(.93)	(1.34)	(3.20)
Female Head Completed College	-.66	-2.09	2.28
	(1.19)	(1.71)	(4.01)
North Central	2.15**	1.51	9.61**
	(.66)	(.90)	(2.45)
South	1.87**	1.95*	4.91*
	(.63)	(.86)	(2.33)
West	2.51**	1.71	7.19**
	(.74)	(1.01)	(2.72)
Family Size	-.06	-.26	-.62
	(.17)	(.25)	(.56)
Monthly Household Income (in 100's)	-.01	-.02	.04
	(.02)	(.03)	(.06)
Urban	-.27	-.44	-1.63
	(.44)	(.60)	(1.62)
Suburban	-.08	-1.45*	-1.09
	(.52)	(.71)	(1.93)
On Diet	-.59	-.83	-3.82
	(1.09)	(1.60)	(3.60)
Sample Selection Correction Factor	-13.34	-23.82	-16.30
	(10.21)	(14.42)	(35.81)

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE B.6

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 1,784)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	2.86 (3.65)	2.46 (5.35)	39.68** (12.24)
SBP Participation	.49 (.84)	-.07 (1.32)	3.43 (3.10)
Black	-1.31 (1.61)	1.23 (2.43)	-10.08 (5.63)
Hispanic	-1.77 (1.48)	-1.77 (2.16)	-11.37* (4.95)
Male	5.61** (1.27)	5.62** (1.81)	17.11** (4.09)
Female Head is Employed	-.60 (.77)	-.52 (1.02)	-1.85 (2.22)
Female Head Completed High School	.01 (.98)	-.34 (1.35)	3.39 (3.01)
Female Head Completed College	3.65* (1.81)	3.45 (2.54)	9.67 (5.71)
North Central	1.29 (.84)	1.33 (1.30)	1.00 (3.05)
South	2.71** (.80)	4.27** (1.24)	-1.92 (2.90)
West	2.82** (.94)	2.38 (1.46)	3.86 (3.41)
Family Size	.26 (.22)	.51 (.29)	-.30 (.65)
Monthly Household Income (in 100's)	-.02 (.03)	-.03 (.04)	.03 (.08)
Urban	-.80 (.57)	-1.52 (.88)	-1.87 (2.05)
Suburban	.74 (.66)	.04 (1.03)	-1.74 (2.43)
On Diet	-2.28 (1.73)	-3.18 (2.40)	-11.45* (5.38)
Sample Selection Correction Factor	24.53 (13.92)	26.81 (20.74)	51.15 (47.76)

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE B.7

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE AT BREAKFAST: STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,304)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	10.82**	11.40	52.32**
	(3.58)	(5.97)	(11.23)
SBP Participation	2.25	.71	7.73
	(1.69)	(2.81)	(5.31)
Black	.20	-.03	-12.14*
	(1.71)	(2.85)	(5.36)
Hispanic	-.58	-.50	-19.73**
	(1.93)	(3.21)	(6.04)
Male	8.45**	11.44**	25.75**
	(1.42)	(2.37)	(4.44)
Female Head is Employed	-1.24	-.82	-.49
	(.84)	(1.40)	(2.63)
Female Head Completed High School	.21	-.18	-1.32
	(.90)	(1.51)	(2.83)
Female Head Completed College	-2.34	-4.39	-1.13
	(1.80)	(3.01)	(5.65)
North Central	-1.16	-3.02	-1.13
	(1.29)	(2.15)	(4.06)
South	1.66	3.34	-.83
	(1.17)	(1.95)	(3.68)
West	1.74	-.28	-.15
	(1.50)	(2.50)	(4.72)
Family Size	-.14	-.06	-.47
	(.21)	(.35)	(.66)
Monthly Household Income (in 100's)	.05	.04	.20*
	(.03)	(.05)	(.10)
Urban	-1.63	-2.80	-5.16
	(.88)	(1.46)	(2.75)
Suburban	-1.27	-3.24	-1.91
	(1.04)	(1.73)	(3.26)
On Diet	-.05	-1.19	-10.65*
	(1.53)	(2.55)	(4.79)
Sample Selection Correction Factor	-.63	4.33	-2.39
	(9.35)	(15.60)	(29.32)

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE B.8

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 5 TO 10 YEARS OF AGE
(Standard errors in parentheses, N = 2,503)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	28.46**	44.07**	123.99**
	(6.64)	(8.08)	(21.95)
SBP Participation	-2.26	-3.72	-10.14
	(1.88)	(2.29)	(6.23)
NSLP Participation	4.69**	-2.47	-15.00**
	(1.36)	(1.66)	(4.51)
SMP Participation	7.66**	8.85**	14.39**
	(1.67)	(2.04)	(5.54)
Black	3.26*	3.56	5.40
	(1.55)	(1.88)	(5.12)
Hispanic	-.07	-6.86**	-4.70
	(2.14)	(2.61)	(7.09)
Male	9.12**	9.65**	21.44**
	(1.13)	(1.37)	(3.73)
Female Head is Employed	-.17	1.65	-3.39
	(1.20)	(1.46)	(3.97)
Female Head Completed High School	-2.78	-3.38	-9.17
	(1.42)	(1.73)	(4.69)
Female Head Completed College	-.47	.13	2.02
	(1.86)	(2.26)	(6.15)
North Central	-1.76	-2.38	7.30
	(2.05)	(2.49)	(6.78)
South	-1.50	-.77	7.64
	(1.94)	(2.36)	(6.42)
West	-4.78*	-2.58	.41
	(2.28)	(2.77)	(7.53)
Family Size	-.55	-.87*	-2.31
	(.36)	(.44)	(1.20)
Monthly Household Income (in 100's)	.03	-.00	.06
	(.05)	(.06)	(.15)
Urban	-.29	-3.19	-7.36
	(1.37)	(1.67)	(4.54)
Suburban	1.05	-3.92*	-11.53*
	(1.62)	(1.98)	(5.37)
On Diet	3.10	.92	-3.08
	(2.36)	(2.87)	(7.80)
Ate Breakfast	12.83**	12.31**	51.36**
	(2.31)	(2.81)	(7.63)
Ate Lunch	11.54*	15.36**	52.70**
	(4.82)	(5.86)	(15.93)
Ate Dinner	15.78**	13.35**	32.46**
	(3.25)	(3.95)	(10.74)
R^2	.067	.055	.053

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE B.9

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS: STUDENTS 11 TO 14 YEARS OF AGE
(Standard errors in parentheses, N = 2,018)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	31.23**	43.73**	144.26**
	(6.58)	(8.27)	(22.35)
SBP Participation	-3.15	-7.35*	-13.74
	(2.83)	(3.56)	(9.63)
NSLP Participation	3.74*	-.66	-16.63**
	(1.79)	(2.26)	(6.09)
SMP Participation	4.92	5.95	8.12
	(2.82)	(3.54)	(9.57)
Black	-.51	2.85	2.04
	(2.02)	(2.55)	(6.88)
Hispanic	-8.99**	-16.64**	-16.58
	(2.91)	(3.66)	(9.88)
Male	19.75**	19.98**	54.72**
	(1.49)	(1.88)	(5.06)
Female Head is Employed	-.55	1.36	-2.75
	(1.57)	(1.97)	(5.32)
Female Head Completed High School	3.67*	-1.43	1.67
	(1.81)	(2.28)	(6.15)
Female Head Completed College	.30	-1.55	8.36
	(2.44)	(3.07)	(8.29)
North Central	-6.14*	-7.70*	-5.10
	(2.67)	(3.35)	(9.06)
South	-3.32	-5.60	-4.23
	(2.52)	(3.17)	(8.57)
West	-1.83	-4.10	-8.10
	(2.97)	(3.73)	(10.08)
Family Size	-1.04*	-0.46	-2.35
	(.44)	(.55)	(1.48)
Monthly Household Income (in 100's)	-.08	-.12	-.04
	(.06)	(.07)	(.19)
Urban	2.35	-.28	-4.77
	(1.76)	(2.21)	(5.97)
Suburban	-2.08	-7.70**	-23.58**
	(2.15)	(2.70)	(7.29)
On Diet	-7.13*	-12.48**	-36.80**
	(2.86)	(3.60)	(9.73)
Ate Breakfast	15.41**	15.74**	57.58**
	(2.34)	(2.95)	(7.96)
Ate Lunch	14.84**	22.42**	59.67**
	(3.83)	(4.82)	(13.01)
Ate Dinner	18.07**	16.41**	27.89*
	(3.61)	(4.54)	(12.25)
R^2	.162	.127	.125

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

TABLE B.10

EQUATIONS FOR INTAKE OF PROTEIN, FAT, AND CARBOHYDRATE OVER 24 HOURS:
STUDENTS 15 TO 21 YEARS OF AGE
(Standard errors in parentheses, N = 1,639)

	Dependent Variables		
	Protein (gm)	Fat (gm)	Carbohydrate (gm)
Constant	27.41**	41.60**	135.59**
	(7.29)	(8.83)	(21.44)
SBP Participation	3.73	-1.74	5.81
	(5.41)	(6.56)	(15.93)
NSLP Participation	8.07**	2.96	10.43
	(2.35)	(2.85)	(6.91)
SMP Participation	15.67**	10.56	(24.72
	(5.40)	(6.55)	(15.90)
Black	-4.69	-7.53*	-31.55**
	(2.88)	(3.49)	(8.47)
Hispanic	-8.59*	-19.84**	-42.60**
	(4.09)	(4.96)	(12.04)
Male	45.71**	47.73**	122.76**
	(2.11)	(2.55)	(6.20)
Female Head is Employed	-.47	.93	4.40
	(2.21)	(2.67)	(6.50)
Female Head Completed High School	-.18	1.63	-.31
	(2.48)	(3.01)	(7.31)
Female Head Completed College	-.03	-1.33	1.98
	(3.54)	(4.29)	(10.42)
North Central	-8.66*	-9.95*	-3.29
	(3.71)	(4.49)	(10.91)
South	-6.09	-5.42	1.27
	(3.34)	(4.05)	(9.84)
West	-3.20	-7.61	-5.69
	(4.25)	(5.15)	(12.50)
Family Size	-1.47*	-1.62*	-3.93*
	(.59)	(.72)	(1.74)
Monthly Household Income (in 100's)	.23**	.13	.16
	(.07)	(.09)	(.22)
Urban	3.23	2.00	1.89
	(2.51)	(3.04)	(7.38)
Suburban	-3.00	-4.10	.96
	(2.98)	(3.61)	(8.77)
On Diet	-4.60	-9.09*	-46.39**
	(3.34)	(4.05)	(9.83)
Ate Breakfast	9.90**	12.34**	35.87**
	(2.62)	(3.17)	(7.70)
Ate Lunch	16.55**	25.05**	60.37**
	(3.56)	(4.31)	(10.47)
Ate Dinner	22.76**	16.89**	34.90**
	(4.20)	(5.09)	(12.36)
R^2	.321	.270	.301

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

*(**): Significant at the .05(.01) level, two-tailed test.

Table of Contents

APPENDIX C

COMPARISON OF FINDINGS FROM THIS STUDY WITH FINDINGS FROM NESNP-1

Table of Contents

TABLE C.1

COMPARISON OF FINDINGS FROM THIS STUDY WITH FINDINGS FROM NESNP-1:
DIFFERENCES IN NUTRIENT INTAKE BETWEEN SBP PARTICIPANTS AND NONPARTICIPANTS

	Findings From This Study						Findings From NESNP-1			
	Students 5 to 10 Years of Age		Students 11 to 14 Years of Age		Students 15 to 21 Years of Age		Elementary Sample		Secondary Sample	
Dietary Component	Breakfast Intake	24-Hour Intake	Breakfast Intake	24-Hour Intake	Breakfast Intake	24-Hour Intake	Breakfast Intake	24-Hour Intake	Breakfast Intake	24-Hour Intake
Food Energy	+	o	o	-	o	o	o	o	o	o
Vitamin B_6	o	o	o	-	o	o	--	o	o	o
Vitamin A	o	-	-	o	o	o	--	o	o	o
Iron	--	--	--	o	o	o	--	o	--	o
Calcium	++	o	+	o	++	+	++	++	++	++
Magnesium	+	o	o	o	o	o	++	o	o	+

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987; The National Evaluation of School Nutrition Programs: Final Report, Volume 2-Technical Appendices, April 1983. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.

o: No statistically significant difference.
+(++): Difference between SBP participants and nonparticipants is positive and significant at the .05(.01) level.
-(--): Difference between SBP participants and nonparticipants is negative and significant at the .05(.01) level.

Table of Contents

APPENDIX D

TABLE OF SUMMARY STATISTICS FOR INDEPENDENT VARIABLES USED IN THE NUTRIENT INTAKE ANALYSES

Table of Contents

TABLE D.1

SUMMARY STATISTICS FOR INDEPENDENT
VARIABLES USED IN THE NUTRIENT INTAKE ANALYSES

	Age of Student					
	5-10 Years		11-14 Years		15-21 Years	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
SBP Availability	.40	.25	.37	.48	.31	.46
SBP Participation	.13	.33	.08	.28	.04	.20
Black	.23	.43	.23	.42	.23	.42
Hispanic	.09	.29	.09	.28	.09	.28
Male	.50	.50	.50	.50	.50	.50
Female Head is Employed	.54	.50	.56	.50	.60	.49
Female Head Completed High School	.71	.46	.67	.47	.65	.48
Female Head Completed College	.11	.32	.12	.32	.10	.31
North Central	.20	.40	.21	.41	.20	.40
South	.53	.50	.53	.50	.55	.50
West	.14	.34	.14	.35	.12	.32
Family Size	4.85	1.65	5.07	1.77	5.00	1.82
Monthly Household Income (in 100's)	16.35	13.31	17.75	14.51	19.18	15.58
Urban	.33	.47	.33	.47	.30	.40
Suburban	.22	.41	.21	.41	.21	.40
On Diet	.06	.24	.07	.26	.11	.32
Ate Breakfast	.93	.25	.88	.32	.80	.40
Ate Lunch	.99	.12	.96	.21	.89	.32
Ate Dinner	.97	.17	.96	.21	.93	.25

SOURCE: The Dietary Impacts of the School Breakfast Program, April 1987. Data are from the National Evaluation of School Nutrition Programs, Fall 1980.